WAYSIDE & WOODLAND BLOSSOMS

A GUIDE TO BRITISH WILD FLOWERS INCLUDING ALL THE ORCHIDS

BY

EDWARD STEP

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WAYSIDE AND WOODLAND BLOSSOMS

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3 *Pl.* 1. **Lady's Slipper Orchis.** (p. 159). *Frontispiece.*
Cypripedium calceolus. ORCHIDACEAE.

Wayside and Woodland Blossoms

A POCKET GUIDE TO BRITISH WILD-FLOWERS
FOR THE COUNTRY RAMBLER

(*THIRD SERIES*)

With clear descriptions of 153 species including all the British Orchids

BY

EDWARD STEP, F.L.S.

AUTHOR OF
"WAYSIDE AND WOODLAND TREES," "WAYSIDE AND WOODLAND FERNS"
"SHELL LIFE," ETC.

WITH
COLOURED FIGURES OF 64 SPECIES
87 PHOTOGRAPHIC REPRODUCTIONS
AND
119 TEXT ILLUSTRATIONS
INCLUDING
A PICTORIAL COLOUR KEY TO THE PLATES

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CONTENTS

	Page
Preface	vii
The Forms of Leaves	ix
A Pictorial Colour Key to the Plates	xvii
Descriptions of Wild-Flowers	1
What are Orchids?	73
British Orchids	83
Family Characters of British Plants	162
Classified Index to Natural Orders, Genera and Species described in this Volume	168
General Index	171

148192

PREFACE

In the First and Second Series of *Wayside and Woodland Blossoms*, no pretence was made that the work could include more than a liberal selection of the wild flowering plants of the British Isles; but from time to time many readers who have found these volumes useful in the field have expressed their desire for a supplement including, not only some of the familiar plants that had been omitted, but some of the less attractive and consequently little known species.

The Author and Publishers have at length decided to meet this demand by issuing a Third Series, which, besides some well-known flowers, includes a number of those that are less conspicuous or that are more local in their occurrence. Recognizing that our native Orchids had formerly too slight a representation for a group so popular, a considerable section of the volume has been devoted to a description of all the species, preceded by an account of their remarkable symbiotic relationships.

A new feature is the inclusion of a number of photographs of the plants described. For those reproduced as Plates 136, 138, and 139, we are indebted to Mr. E. J. Bedford; and for Plates 3, 39, 93, and 117, to Mr. A. W. Dennis; the others are by the Author.

The volume is sent out with the hope that it may prove not less helpful than its companions in the Series to the Author's considerable brotherhood of Nature-lovers.

THE FORMS OF LEAVES

In the First Series of *Wayside and Woodland Blossoms* some explanation was given of the technical terms by which the various combinations (inflorescence) of flowers are indicated, as an aid to the identification of species.

A similar importance attaches to the varied forms of foliage; and in the descriptions of plants following the shapes of the leaves are indicated, as far as is possible, in ordinary language, such as oval, lance-shaped, awl-shaped, etc. It has been thought, however, that a series of diagrams representing the principal forms of leaves would be useful for reference; and such figures are now given. The terms used apply to the *blade* (lamina) of the leaf, the expanded portion apart from the leaf-stalk (petiole) which is often absent, when the leaf is said to be *sessile*.

If a leaf is described as *simple* it is undivided, as in Beech; if *compound* the blade is broken up into two or more portions (leaflets), as in Clover and Ash. There are many different plans upon which compound leaves are divided, and these have each a definite term to express the manner and degree of the dissection.

Taking simple leaves first: we have an elemental type in the thick leaves of many of the Conifers, such as Scots Pine and Larch, which are *needle-shaped* (acicular) owing to the slight breadth and comparatively great length, ending in a sharp point. If a leaf of this form instead of having parallel sides, tapers from a thicker base to a fine point, as in the Furze, it is *awl-shaped* (subulate). Somewhat similar, but of more equal breadth, are the narrow

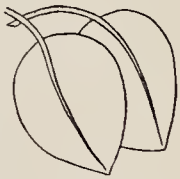
(linear) leaves of Purple Heath, a term which applies also to the very long leaves of the Grasses; if this form has thickness as well as length and narrowness, so that it stands erect, as in the Flag and Bog Asphodel, it is said to be *sword-shaped* (ensiform). A leaf that is about twice as long as broad and with both ends rounded, as in Rockrose, is *oblong*.

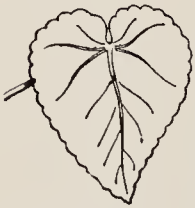
Sword-shaped

Of leaves with the sides more curved, there is a number of variations in the shape, starting from the fully *round* (orbicular) blade of Sundew and Marsh Pennywort; then, by narrowing the width and tapering to each end, we get the *oval* or egg-shaped (ovate), as in Blackthorn. If this form, instead of tapering to the stalk, is there broadened into two rounded lobes, we have the *heart-shaped* (cordate) shown in the leaves of the Violet and the Dead-nettles. The heart-shaped broadened and the tip rounded becomes *kidney-shaped* (reniform). By lengthening the oval and tapering both ends equally, we get the *elliptical* leaf, as in Sallow. Leaves nearly of this form, but with the lower end broader from which there is a gradual tapering to the tip, are *lance-shaped* (lanceolate), as in Rib-

Oblong

Round


Oval or Egg-shaped


Heart-shaped

Kidney-shaped

wort Plantain. Should this widening of the base be more extensive and continued in two pointed lobes directed downwards, the leaf is *arrow-shaped* (sagittate) as in Sorrel and the younger leaves of Arrowhead; if, however, these lobes turn outwards, as in Sheep's-sorrel and Cuckoo-pint, the leaf is said to be *halberd-shaped* (hastate). The tip of the leaf may be its broadest part from which it tapers to the base: it is then *spoon-shaped* (spatulate), as in the Daisy. In scientific descriptions, the prefix *ob-* is often attached to the technical terms, such as obovate, oblanceolate, etc., and this indicates that the form is reversed, that the broader end of the oval, for example, is remote from the stalk. In this work such prefix is not used.

Arrow-shaped

Stipules

Connate Leaves

Other terms are used to indicate supplemental processes of the leaf. At the base of the leaf-stalk there may be a pair of small outgrowths known as *stipules*, such as we may see on the leaf-stalk of the Roses. If the blade of a stalkless leaf half encircles the stem or branch, it is described as *clasping* (amplexicaul), as we see in Penny-cress and Shepherd's Purse. A pair of opposite, stalkless leaves may have their bases united, as in Yellow-wort and Teasel: they are *connate*. A single stalkless leaf whose base extends unbroken around the stem is *perfoliate*, as seen in Hare's-ear.

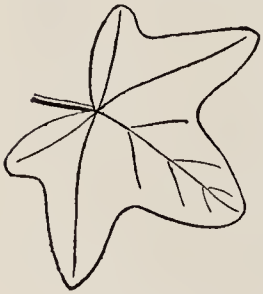
Perfoliate Leaf

The *compound* leaf includes a vast number of forms, exhibiting a greater unlikeness one to another than we have seen in the simple leaves, yet showing a gradation in the complexity of their division; and the beginning of the process may be seen in many simple leaves whose margins are cut deeply into lobes, such as the *angular* lobes of the Ivy and the *wavy* (sinuous) lobes of the Oak. If the cutting goes deeply enough, there is a separation of the blade into *leaflets*, and we get a compound leaf. One of the simpler forms of this division is found in the *trefoils* (ternate leaves) of Wood-sorrel, Clover and Strawberry. An advance upon this is seen in the Cinque-foil, where a round leaf is broken up into five leaflets (quinate), and as these are arranged finger-fashion we may call it *digitate*. In Hellebore, with a similar radial arrangement of the leaflets, the lowest pair are themselves divided so that their divisions have a common foot-stalk; and the leaf is *pedate*. In the several forms of these *palmate* leaves, it will be seen that the arrangement is due to a branching of the midrib from the top of the leaf-stalk.

Simple and Entire Leaf

Opposite Leaves

Wavy-lobed

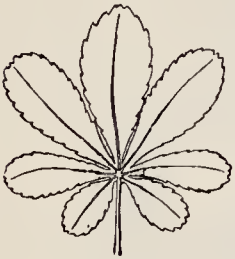

Angular-lobed

Trefoil

In leaves of elongate shape that have been cut into leaflets from each side, and as the leaflets on opposite sides form pairs, as in the Vetches, the whole leaf has a feather-like appearance: so it is known as a *pinnate* leaf. If, however as mostly happens, there is an odd leaflet at the tip of the midrib, the leaf is *imparipinnate:* such a leaf on a large scale will be found on the Ash, and a smaller is provided by Lady's Smock. A modification of the plan is produced in Meadow-sweet and Silverweed by the insertion, as it were, of smaller leaflets alternating with larger ones: such a leaf is said to be *interruptedly pinnate.* Another variation of the pinnate leaf is that of Herb Bennet, where the terminal leaflet is hugely larger than the others, which diminish in size downwards: this form is known as a *lyrately pinnate* leaf, from its superficial resemblance to the simple *lyrate* leaves of some of the Composites. In some plants, such as the exotic Acacias, the leaflet itself is pinnate, when the leaf as a whole is *bipinnate.* The Meadow-rue is an advance upon this, for some of its leaves are tripinnate. When the division of the leaf becomes more

Digitate Leaf

Pinnate Leaf



Palmate Leaf

Pedate Leaf

complicated even than this, as it does in some of the Umbellifers, it is sufficient to speak of it as *decompound*.

The margins of both simple leaves and the leaflets of compound leaves may be either *entire*, cut into lobes or notched into teeth, and the teeth may be very distinct in their pattern and distribution: close or distant, fine or coarse, sharp or rounded; and if large their own edges may have secondary teeth. It is scarcely necessary, however, to give details or figures of these. Of the lobing it would be well to add a few words, as this modifies the form of some of the simple leaves, and at times may cause confusion between simple and compound leaves.

Entire

Decompound

The simplest tendency towards lobing may be seen in those leaves that have a sinuous or waved outline, for in some the sinuses are so deep that lobes are formed: this may be seen in Oak. In the Ivy the cutting is, perhaps, simpler, but its effect is to mark out the leaf into five broad triangular lobes. In Cat's-ear the edges of the long, slender leaf are scalloped deeply, leaving small pointed lobes between the broad scallops. In Dandelion the incisions are narrower, but so deep that they get near to the midrib, separating large tooth-like portions of the blade whose long points are curved downwards, producing the type known as *runcinate*. It is also, of course, *pinnatifid*, because the lobes are arranged featherwise after the fashion of

Toothed

3 *Pl.* 2. **Common Meadow-rue** (p. 1). *A* xiv.
Thalictrum flavum. RANUNCULACEAE.

3 *Pi.* 3. **Mouse-tail.** (p.4). *A* xv.

Myosurus minimus. RANUNCULACEAE.

the leaflets of a pinnate leaf. In the deeply and widely pinnatifid leaf of Hardheads, the segments are themselves lobed and toothed, as they are also in Ragwort, where they are much longer. In Milfoil, where the radical leaves are very long and slender (linear-oblong) the numerous lobes are again lobed, so that the whole leaf is tripinnatifid.

The list is not exhaustive, and with one exception the examples have been drawn from native plants; but it is sufficiently comprehensive to show that a quite interesting study may be made of leaves and the manner of their distribution on the plants. In this connection it should be pointed out that, where possible, the radical leaves should be compared with the stem-leaves (cauline), as there may be a great difference between the two. In many cases the substance of the root-leaves is drawn upon for the building up of the stem and its appendages, and when this has been accomplished the lower leaves may have disappeared entirely; they must then be sought in a younger example. The leaves of seedlings, also, should be examined and compared with the foliage of the mature plant. They are often very different and may give clues to ancestral relationships, not only of species but of genera as well. Owing to the frequent dissimilarity between the infant and the adult, it is not always possible to say to which species a seedling belongs, but help in this direction may be obtained by securing ripe seeds from a known wild plant and germinating them in seed-pans.

A PICTORIAL COLOUR KEY TO THE PLATES INCLUDED IN THIS VOLUME

ORDER OF COLOURS

White - - - - - - -	*Page*	xix
Shades of Red - - - - - -	,,	xxii
Shades of Yellow - - - - -	,,	xxiii
Shades of Blue - - - - -	,,	xxvi
Shades of Lilac - - - - -	,,	xxvii
Shades of Purple - - - - -	,,	xxviii
Shades of Green - - - - -	,,	xxx
Shades of Brown - - - - -	,,	xxxii

Pl. 20. Common Pearlwort

Pl. 21. Heath Pearlwort

Pl. 23. Sea Sandwort

Pl. 59. Shoreweed

Pl. 16. Awlwort

Pl. 9. Common Whitlow-grass

Pl. 64. Privet

Pl. 76. Chickweed Wintergreen

Pl. 78. Brookweed

Pl. 126. Summer Lady's-Tresses

Pl. 124. Creeping Lady's-Tresses

Pl. 121. Autumn Lady's-Tresses

Pl. 120. White Fragrant Orchis

Pl. 118. Lesser Butterfly Orchis

Pl. 143. White Helleborine

Pl. 136. Narrow-leaved Helleborine

Pl. 113. Greater Butterfly Orchis

Pl. 14. Pepperwort

Pl. 15. Common Scurvy-grass

Pl. 19. Sea-Kale

Pl. 33. Wall Pennywort

Pl. 75. White Horehound

Pl. 7. Climbing Corydalis

Pl. 10. Water-cress

Pl. 37. Hedge Parsley

Pl. 30. Goutweed

Pl. 35. Angelica

Pl. 28. Tree Mallow

Pl. 26. Marsh Mallow

Pl. 4. Pheasant's-eye

Pl. 62. Yellow Bird's-nest

Pl. 3. Mouse-tail

Pl. 122. Musk Orchis

Pl. 139. Fen Orchis

Pl. 5. Lesser Spearwort

Pl. 67. Gentianella

Pl. 38. Mistletoe

Pl. 1. Lady's Slipper Orchis

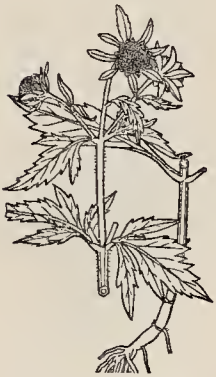
Pl. 40. Wild Madder

Pl. 44. Golden Rod

Pl. 31. Lady's Mantle

Pl. 56. Shrubby Hawkweed

Pl. 57. Mouse-ear Hawkweed



Pl. 46. Bur-Marigold

Pl. 69. Henbane

Pl. 54. Small Rough Hawk's-beard

Pl. 45. Smooth Hawk's-beard

Pl. 55. Stinking Hawk's-beard

Pl. 36. Wild Parsnip

Pl. 2. Common Meadow-rue

Pl. 8. Welsh Poppy

Pl. 6. Globe-flower

Pl. 39. Alexanders

Pl. 42. Sea Aster

Pl. 60. Venus' Looking-glass

Pl. 58. Round-headed Rampion

Pl. 24. Salt-marsh Sand-spurrey

Pl. 17. Sea Rocket

Pl. 13. Coral-root

Pl. 89. Green-winged Orchis

Pl. 90. Early Purple Orchis

Pl. 92. Dark-winged Orchis

Pl. 97. Dwarf Orchis

Pl. 95. Monkey Orchis

Pl. 98. Spotted Orchis

Pl. 100. Early Marsh Orchis

Pl. 102. Pyramidal Orchis

Pl. 103. Broad-leaved Marsh Orchis

Pl. 141. Marsh Helleborine

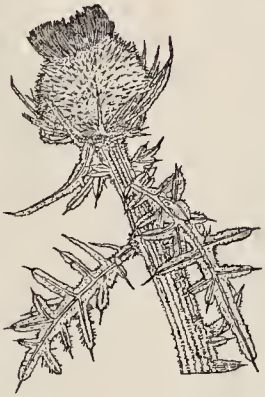
Pl. 107. Fragrant Orchis

Pl. 71. Weasel-snout

Pl. 29. Water Purslane

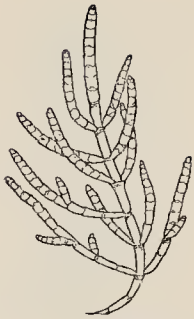
Pl. 73. Black Horehound

Pl. 49. Saw-wort



Pl. 51. Woolly-headed Thistle

Pl. 53. Milk Thistle



Pl. 61. Annual Glasswort

Pl. 137. Coral-root Orchis

Pl. 82. Shrubby Seablite

Pl. 83. Annual Seablite

Pl. 104. Lizard Orchis

Pl. 108. Green-Man Orchis

Pl. 111. Frog Orchis

Pl. 129. Twayblade

Pl. 134. Broad-leaved Helleborine

Pl. 135. Violet Helleborine

Pl. 138. Bog Orchis

Pl. 81. Great Water Dock

Pl. 80. Curled Dock

Pl. 85. Blood-veined Dock

Pl. 87. Common Sorrel

Pl. 74. Spreading Orache

Pl. 132. Bird's-nest Orchis

Pl. 114. Bee Orchis

Pl. 116. Early Spider Orchis

Pl. 119. Fly Orchis

WAYSIDE & WOODLAND BLOSSOMS

Meadow-rue (*Thalictrum flavum*).

THOUGH the Meadow-rues are members of the Buttercup family (Ranunculaceæ), the rambler who for the first time encounters either of the three or four British species is not likely at sight to connect it with its commoner relations, the possessors of broad petals of burnished gold. None of the Meadow-rues has petals, and their small sepals are but poor substitutes.

Common Meadow-rue (*Thalictrum flavum*) is the largest and most striking of the native species. It should be sought in swampy fields and on the banks of rivers and streams, where in July and August our attention is arrested by the large, bright yellow flower-clusters that terminate the tall, upright stems. These stems are stout and furrowed, and arise from a perennial, creeping, yellow rootstock, which sends out runners; their height varies from two to four feet. The smooth, long-stalked, dull-green leaves, which are somewhat paler on the lower surface, are broken into three stalked divisions, and each of these into paired leaflets which are wedge-shaped and end in three lobes. The branching flower-cluster, when examined closely, is found to be deceptive, for its brightness is due to the spreading stamens, of which there are about twenty-four; and the four small sepals are cream-coloured. All the flowers are upright on their stalks. The carpels are of the achene type so common in this family: there are from six

to ten of them, each producing a single seed. It will be seen that, in structure, the flower agrees very closely with that of the Traveller's Joy (see First Series, p. 6), where, however, the sepals are much larger.

The distribution of Common Meadow-rue extends from the South of England to southern Scotland, where it is rare; it occurs locally in Ireland. Meadow-rue flowers are of a type between wind-pollinated and insect-pollinated: there is no provision of nectar, but those of the Common species are visited by flies and beetles for the sake of their abundant pollen; the Lesser and the Alpine apparently are more dependent on the wind (Plate 2).

Lesser Meadow-rue (*Thalictrum minus*) appears under several more or less distinct forms, which some authorities treat as separate species; but their differences are due, probably, to the varied conditions under which they may be found growing. The more typical forms are between six inches and a foot and a half high, with finely furrowed, branching stem (usually solid), leafless below, but with loose sheaths at the base. The leaflets are variable and are of glaucous hue. The greenish-yellow flowers droop, and they have only from three to five carpels, which are spindle-shaped with eight ribs. It is found in dry, stony pastures and about sand-dunes, flowering from June to August.

Greater Meadow-rue (*Thalictrum majus*), which is regarded by some authors as a sub-species or form of *T. minus*, attains a height of three or four feet. The solid stem is more leafy below and finely grooved, but in the Lake District there is a form with hollow stem, grooved beneath the nodes only. The drooping flowers are as stated under the Lesser Meadow-rue, but the carpels are oval or elliptical. It occurs in moist copses and stony places, chiefly in the North.

3 *Pl.* 4 **Pheasant's-eye.** (p. 3). *B* 2.

Adonis annua. RANUNCULACEAE.

3 *Pl.* 5. Lesser Spearwort. (p. 5). *B* 3.
Ranunculus flammula. RANUNCULACEAE.

Alpine Meadow-rue (*Thalictrum alpinum*) is a rare, diminutive plant, only four to six inches high, found in boggy places far up the mountains of Wales and the North, its vertical range extending to 4,000 feet above sea-level; it is more rare in Ireland than in Britain. The wiry stems are unbranched, and end in a simple spray of a few purplish-white drooping flowers, which have from eight to twenty hanging stamens and only two or three curved carpels, which have footstalks. The leaves are mostly from the roots, with long stalks and rounder leaflets, which have blunt lobes and are glaucous beneath. Flowers, June to August.

Pheasant's-eye (*Adonis annua*).

Beyond being well established in Suffolk and some places in southern England, it must be stated, with regret, that the Pheasant's-eye is not one of our native plants, but one of those immigrants from the Continent that have found it advantageous to hang about the lightened soil of our cornfields. It is fond especially of those upon a chalky subsoil. Although an alien, it has been with us sufficiently long to have received notice from Gerarde (1597), who says it was known as Rose-a-rubie and Red Maithes; another name for it was Red Morocco (Plate 4).

Pheasant's eye, like most of these weeds of cultivated ground, is an annual. It has an erect, branching and leafy stem, which attains a height of eight or ten inches. The stalkless leaves are much divided and subdivided, the ultimate segments very slender. The flowers, which may appear as early as May and be found as late as September, are somewhat globular in form, owing to the concavity of the petals. The five spreading sepals are purplish-green, and the more erect, five to ten petals are blood-red with a

purplish-black base; they are without the nectar-gland found on the petals of their near allies, the Buttercups. Both stamens and carpels are numerous, the latter forming an oval head which lengthens after pollination. The honey-bee has been noted as one of its visitors, though it can obtain only pollen for its pains.

The Pheasant's-eye is a native of Europe, Western Asia and North Africa. The botanical name is ancient, and perpetuates the myth that the flower owes its colour to the blood of Adonis, which fell upon it when he was killed by the wild boar.

Mouse-tail (*Myosurus minimus*).

LIKE the Pheasant's-eye, the Mouse-tail is an annual plant of the cornfields, but in this case the authorities have no hesitation in regarding it as a true native, though a somewhat rare one, and in England only. It has a preference for moist fields on a sandy or gravelly soil (Plate 3).

The numerous slender leaves all come direct from the root, and stand erectly: including the long footstalk they measure from an inch to three inches long, and are smooth and fleshy. From the axils of these leaves, where they join the crown, arise many naked scapes, about five inches high, each supporting a single flower, which may be found from April to June. This consists of five narrow-oblong sepals, each ending below in a little spur which is pressed closely to the scape; five short, strap-shaped, greenish-yellow petals, narrowed to a claw below; there are few stamens, but many carpels crowded on a thread-like spike, which elongates before the petals have dropped. When the carpels have matured into fruits (achenes), the spike may be as much as three inches long, when it presents the appearance that has suggested the names of the plant.

3 *Pl.* 6. Globe-flower. (p. 7). *B* 4.

Trollius europaeus. RANUNCULACEAE.

3 *Pl.* 7. **Climbing Corydalis.** (p. 9). *B* 5.
Corydalis claviculata. FUMARIACEAE.

This likeness to the scale-ringed tail of the domestic mouse must have struck our forefathers at an early date : both Parkinson and Gerarde refer to it as *Cauda muris*, which is Mousetail in Latin, and later taxonomists have put it into the Greek form of *Myosurus*.

If one of the small petals be detached, it will be seen that there is a nectary on the claw ; its product serves to attract small flies, which assist, no doubt, in the work of cross-pollination.

Lesser Spearwort (*Ranunculus flammula*).

WHEREVER throughout our islands there is wet ground, be it a streamside pond margin, ditch or bog, even at some height in the mountains, we are sure, during the summer months, to find it brightened by numerous golden flowers of the Lesser Spearwort (Plate 5).

Although a perennial herb of the Buttercup family, until its flowering season opens in the latter half of May there is nothing to connect it at sight with the familiar Buttercups of the field and wayside. The stalked lower leaves are quite unlike the broad, divided foliage of those, being oval, smooth and only occasionally are slightly toothed. As a rule the stems have a tendency to lie upon the wet ground and send out roots, then take an upward direction, so that when flowering they appear erect. They reach a height of six to twenty inches, much branched to provide supports for the abundant flowers, each with its own long stalk. The stem-leaves are more slender than those from the root, and are without foot-stalks, narrow-lance-shaped and with a few slight teeth.

The flowers may be found from May to September, and are usually between three-quarters and one inch across. They consist of five concave sepals, five to seven bright

yellow, shining petals, with a central group of carpels surrounded by numerous stamens, which mature in advance of the carpels. The flowers are succeeded by a small head of nut-like achenes, each containing a single seed.

A sub-species (*R. reptans*), reported from Loch Leven and Ullswater, has thread-like creeping stems, very slender leaves and much smaller flowers. The stem roots from every node.

Greater Spearwort (*Ranunculus lingua*) is a very similar perennial, but of twice the dimensions of *flammula*. It is rather less widely distributed, rather rare, and its habitat more exclusively marshes and the edges of lakes. It has a stout, hollow stem which stands erectly to a height between two and four feet. The lower leaves, which are under water, are broad heart-shaped with blunt tip ; those on the stem are half-clasping, lance-shaped, from six to ten inches long, with or without teeth.

The flowers, found from June to September, are much like those of the Lesser Spearwort, but may be two inches across ; and the carpels mature before the stamens. The large size of the shining yellow flowers renders the plant a very striking object, which there is little danger of confusing with the smaller species.

Serpent's-tongue Spearwort (*Ranunculus ophioglossifolius*) is an exceedingly rare Buttercup of the same group. It is a small annual that has been recorded as occurring in marshes in Hampshire and Gloucestershire. It has a slender stem, from six to ten inches long, at first lying upon the ground, then rising erectly : furrowed and hollow. The lower leaves have long stalks, and are broadly oval or heart-shaped : the stem-leaves stalkless, oblong, clasping the stem. The yellow flowers appear from June to August : though very numerous, they are only a quarter of an inch

3 *Pl.* 8. **Welsh Poppy.** (p. 8). *B* 6.
Meconopsis cambrica. PAPAVERACEAE.

3 *Pl.* 9. Common Whitlow-grass. (p. 14). *B* 7.
Draba verna. CRUCIFERAE.

across, and the petals are only slightly longer than the sepals.

Globe-flower (*Trollius europæus*).

THERE is little need to ask what are the family relations of the Globe-flower, when for the first time we meet with it up in the mountains of western or northern England, Wales or Scotland. Its large, pale yellow blossoms suggest the more golden flowers of Marsh-marigold and its lower leaves those of the acrid Meadow Buttercup. So we have little hesitation in regarding it tentatively as a member of the Buttercup family (Ranunculaceæ) (Plate 6).

Globe-flower is a smooth herb with a perennial rootstock, from which rise the principal leaves on long stalks. The leaf-blade is circular in general outline, but cut up into five wedge-shaped segments, which are lobed and have their edges coarsely toothed; the stem-leaves are smaller and have no stalks. The unbranched flowering-stems vary from a foot to two and a half feet high; and are crowned by the solitary flower that owes its name to the fact that it does not open sufficiently to expose the inner organs. The clear yellow globe is formed by the sepals, of which each flower is provided with from ten to fifteen. These retain their concavity, so that their tips overlap. The petals, which agree in number with the sepals, are quite small and strap-shaped. Within their circle are numerous stamens surrounding the five or more carpels. Some botanists hold that what we have described as petals are really stamens that have not developed their anthers; but against that view it should be pointed out that each petal has a glandular pit in which nectar is produced, as in the little pocket on the petal of the Buttercup.

Owing to the proximity of anthers and carpels, it is obvious that self-pollination must be the rule, both sets of organs maturing at the same time, and the closeness of the sepals making it difficult for any but small insects to get access to them. In spite of these hindrances, it is clear that an occasional cross is desired, as shown by the production of nectar ; and beetles, sawflies, small bees and flies are attracted by its odour. Only the small flies appear to be able to effect an entrance, but these are efficient pollen-carriers. Beetles have been seen trying to obtain entrance by biting through the sepals. After fertilization, the carpels develop into wrinkled follicles, much like those of Marsh-marigold, and containing numerous black seeds, angular and dotted.

The plant is to be found only in moist spots in the mountains, and its flowers appear from May or June till August. In addition to the English and Scottish resorts indicated, it occurs very rarely in the North of Ireland. In Scotland it is known as Lucken Gowan or Cabbage-daisy, owing to the sepals turning in after the manner of the leaves in a garden cabbage. *Trollius* is the latinized form of an old German word suggested by the globular form of the flower.

Welsh Poppy (*Meconopsis cambrica*).

Although the names suggest that this plant is restricted in its British distribution to the Principality, this is not actually the case. Western Poppy would, perhaps, be the more appropriate name for it. Though it has been naturalized in parts of Scotland, its natural range extends no farther north than to Yorkshire (doubtfully to Westmorland) and is continued southwards through Wales and Somerset to Devon and Cornwall ; in Ireland, it occurs

3 *Pl.* 10. **Water-cress.** (p. 11). *B* 8.

Nasturtium officinale. CRUCIFERAE.

3 *Pl.* II. **Water-cress.** (p. 11).
Nasturtium officinale. CRUCIFERAE.

3 *Pl.* 12. **Coral-root.** (p. 13).
Dentaria bulbifera. CRUCIFERAE.

3 *Pl.* 13. **Coral-root.** (p. 13). *B* 9.

Dentaria bulbifera. CRUCIFERAE.

only locally. Its favourite haunts are beside rills and rivulets, moist glens and shady rocky places (Plate 8).

Unlike our red Poppies (see First Series, p. 47), which are all annuals, the Welsh Poppy is a perennial, and its stout, branching rootstock, after a few years, becomes a large tuft. From this rise many radical leaves on long stalks, pale green above and glaucous beneath, cut from the sides into a number of oval lance-shaped segments, which in turn are lobed and toothed. From the stem, which has a woolly base, arise the pale yellow flowers, each on a long footstalk, making the entire height of the plant a foot to two feet. The expanded flower, found from June to August, measures two or three inches across. In structure it agrees closely with those of the genus *Papaver :* there being two hairy sepals and four roundish petals, on which lie the numerous stamens encircling the large ovary with its four or six stigmatic rays. Stamens and stigmas mature at the same time. The ovary develops into an ovoid seed-capsule with four to six short valves opening below the stigmas for the release of the small wrinkled seeds.

The botanical name is compounded of two Greek words, *mekon*, and *opsis*, indicating its likeness to a Poppy

Climbing Corydalis (*Corydalis claviculata*).

HAVING regard for its often considerable height (one foot to four feet), the Climbing Corydalis or Climbing Fumitory may be considered as one of the most delicately constructed and graceful of our flowering plants. But, although it is distributed from south to north of England and well into the northern parts of Scotland, as well as in north-eastern Ireland, it cannot be set down among the more familiar of our wild-flowers. It is a plant that must be looked for, in bushy places, on hillsides and banks where the soil is

moist, and it is not averse from situations that are actually boggy (Plate 7).

Climbing Corydalis is an annual plant of the family Fumariaceæ, and climbs by means of highly sensitive tendrils which are an extension of the midrib of the leaf. These leaves are likely to mislead the novice until he examines them closely, owing to the manner of their division and sub-division. They are relatively large, but are broken up into several stalked leaflets, which are again divided into three, four or five ovals of a glaucous tint. The branching of the midrib beyond the leafy portion to form the clasping tendrils, conveys the impression that the midrib is a branch of the slender, brittle stem, and that the leaflets are complete leaves.

The tiny creamy-white flowers, which may be found from June to August, form little sprays which stand out from the stem opposite to a leaf. Their structure is like that of the Fumitories, the distinction between the two genera being based on differences in the character of the fruits. There are two small, scale-like sepals; four petals (two large and two small); six stamens in two sets of threes. The single-celled ovary develops into a two-valved pod, containing numerous small, shining seeds. The first-formed leaves do not develop tendrils.

The above-mentioned is the only British species, but in and about many villages there will be found growing on old walls and stony banks a Continental species that has escaped from gardens and established itself firmly. This is—

Yellow Corydalis (*Corydalis lutea*), a more robust plant, which, being without tendrils, spreads its angular, foot-long stems around the perennial rootstock and hides them beneath the large leaves. These are broken up into divided leaflets, much after the manner of those of the climbing

3 *Pl.* 14. **Pepperwort** (p. 17). *B* 10.
Lepidium campestre. CRUCIFERAE.

3 *Pl.* 15. **Common Scurvy-grass.** (p. 16). *B* **11.**
Cochlearia officinalis. CRUCIFERAE.

species, but the ultimate divisions are much larger ovals ending in three lobes. The yellow flowers, which are in evidence from May to August, are more than twice the size of those of the previous species, and the sprays are somewhat one-sided.

Here and there in various parts of England, a second escape may be found established on banks near houses, but it cannot be considered as fully naturalized. This is the Tuberous Corydalis (*Corydalis bulbosa*), which springs from a solid perennial tuber an inch across. The stout, unbranched stem is eight to ten inches high, ending in a spray of relatively large purple flowers, in April and May. There are only a few glaucous leaves about the middle of the stem, and these are divided into three wedge-shaped leaflets, which are cut into three lobes. Below each flower is a lobed, leafy bract; and half the length of the flower consists of a hollow spur. Like Yellow Corydalis, it is an introduction from the Continent.

Corydalis is an old Greek plant name, which did service also for the Crested Lark.

Water-cress (*Nasturtium officinale*).

THE hot-flavoured Water-cress can claim to be one of the best-known of our native plants, even though the acquaintance has been established at the table rather than in the field. Knowledge so gained, however, is usually fragmentary and incomplete; so that a detailed description of the living plant rather than of the salad may be desirable.

Water-cress is a perennial aquatic herb, found in all districts of the British Isles where there are watercourses, even the mere outflow of a hillside spring. Under favourable conditions, the hollow stem may be nearly an inch thick and from two to four feet long, floating on the water

or creeping on the mud and rooting from the lower side. The long, narrow leaves are broken up into three to six pairs of roundish heart-shaped leaflets with the edges toothed slightly, and a much larger odd leaflet at the end of the midrib. Where growing exposed to strong sunlight, they take on an olive-brown coloration (Plates 10, 11).

The small white flowers, which may be found from May to October, but are at their best in June and July, are clustered in condensed sprays at the ends of the stem or branch. As in all the members of the Cruciferæ, to which family the Water-cress belongs, there are four sepals half the length of the four petals, six stamens and a pistil of two united carpels with two short styles. They are self-fertile, but the transfer of pollen is helped largely by the visits of small beetles, whose activities, no doubt, also effect occasional crossing. As fertilization proceeds, the spray lengthens to give space to the slender, two-valved pods.

There are two departures from the typical form, so marked that at times they have been treated as distinct species ; but the differences appear to be due to the special conditions under which they are growing. When luxuriant, the stem may become erect and tall, and the leaves so large that the plant resembles somewhat the Water-parsnip : it is known therefore as the var. *siifolium*. On the other hand, through growing on land, it may have a starved appearance, with slender stem and very small leaflets, when it is called var. *microphyllum*.

Our other two species of the genus have *yellow* flowers. They are :

Creeping Yellow-cress (*Nasturtium sylvestre*), found on river-banks and moist wastes, flowering from June to August. It has a creeping rootstock and an angular, wavy stem from six inches to a foot and a half long. The variable

3 *Pl.* 16. **Awl-wort.** (p. 19). *B* 12.
Subularia aquatica. CRUCIFERAE.

3 *P'.* 17. **Sea Rocket.** (p. 20). *B* 13.

Cakile maritima. CRUCIFERAE.

leaves have oblong or lance-shaped leaflets. The flowers are in short sprays ; the petals twice the length of the sepals. Pods slender.

Marsh Yellow-cress (*Nasturtium palustre*) has a more or less erect stem, a foot to two feet long, with lyre-shaped leaves cut into a few broad lobes, of which the terminal lobe is very large. The flowers, found from June to October, are very small, and the petals are no longer than the sepals, and may be shorter. The pod is oval or oblong and inflated.

Neither of the Yellow-cresses can be considered common.

The botanical name is from the Latin *Nasi tortium*, nose-twisting, in allusion to the grimaces produced by eating the hot bitter leaves.

Coral-root (*Dentaria bulbifera*).

A NARROW angle, whose base is filled by Kent and Sussex and whose tip is in Staffordshire, includes the whole area in which the Coral-root (or Coralwort) is regarded as being a British plant It has been found in Scotland, but is considered to be there an introduction from the south. Even in its restricted English region, it is nowhere common ; but when once examined, it is not easily overlooked on a second meeting (Plates 12, 13).

It is a perennial herb of the family Cruciferæ, the only native member of its genus. It has a thick, white, creeping rootstock bearing fleshy scales which, from their likeness to teeth, suggested the name *Dentaria*. The unbranched stem is about two feet high, with alternating leaves and ending in a spray of large lilac or pale-purple flowers, similar in size and structure to those of Lady's Smock. The lower leaves are divided into two or three pairs of toothed, lance-shaped leaflets and a single one forming the

tip. The upper leaves are undivided, and might be leaflets from the lower ones.

The most striking and distinctive character of the plant, however, is the production of dark red bulbils in the axils of the leaves, which fall off when fully formed, then root and develop into new plants. The flat, lance-shaped pods rarely ripen, so that reproduction by seed is not usual. It is a moot point whether the scarcity of seeds is due to the production of the bulbils making seeds unnecessary, or whether it is the failure to ripen seeds that has led the plant to develop bulbils.

Whitlow-grass (*Draba verna*).

Common Whitlow-grass is at once one of the smallest and one of the earliest of our flowering-plants ; in addition, it is one that may be found in all parts of the country, flowering from March to June. Its favourite resorts are old walls, dry banks and stony ground, where it sometimes appears in considerable patches. Yet, in spite of this commonness, it is not one of the plants that everybody can name at sight : the lack of familiarity being due, probably, to the short time during which it is visible (Plate 9).

It is an annual of the family Cruciferæ, usually from an inch to three inches high, but occasionally when growing among grass as much as six inches. The toothed, lance-shaped leaves do not exceed an inch in length, and all spring from the root, spreading around in a little rosette. From the centre of the rosette arise the wavy flower-stems, with the minute white flowers clustered at the summit. These follow the general plan of cruciferous flowers, there being four sepals, four white petals deeply notched and six stamens. The pod is a flat oblong, only a third of an inch long, shorter than its stalk.

3 *Pl.* 18. **Sea-Kale.** (p. 20). *B* 14.

Crambe maritima. CRUCIFERAE.
(young plant)

3 *Pl.* 19. **Sea-Kale.** (p. 20). *B* 15.

Crambe maritima. CRUCIFERAE.

There are four other British representatives of the genus, but they all have the disadvantage of being rare or exceedingly local. These are :

Wall Whitlow-grass (*Draba muralis*), found only on rocks and walls in the limestone districts of western England, from Somerset to Yorkshire, but it occurs locally as an introduced plant in Scotland and Ireland. It is a hairy annual or biennial, with a rosette of small, oval, toothed leaves, and a few others, broader, without stalks, up the stem—which may be a foot or two feet long. The minute white flowers appear in April and May ; and the flat, elliptic pods are smaller than those of the common species.

Yellow Whitlow-grass (*Draba aizoides*) is a perennial that has the distinction of having only one British locality —the neighbourhood of Swansea, where on walls and rocks it forms dense tufts of little rosettes composed of very slender, polished leaves which have the white margins and tips fringed with stiff hairs. The rigid flowering-stems are smooth and leafless, from two to five inches high ; the bright yellow flowers, a third of an inch across, appearing from March to May.

Rock Whitlow-grass (*Draba rupestris*) is found only in a few localities in Scotland and one in Ireland, growing on alpine rocks not lower than an altitude of 3,000 feet. It is a very small perennial, an inch or two inches high, each branch of the rootstock bearing a minute rosette of hairy lance-shaped leaves and a scape with a few white flowers that are only a fifth of an inch across : July and August.

Hoary Whitlow-grass (*Draba incana*), though a rare plant, is less restricted in its range, being found high up on the mountains of the three countries, as well as on sand-hills by sea in western Ireland. It is a perennial, with a long, woody rootstock and a rosette of short oblong leaves, from which rises the stem to a height of more than a foot,

with numerous clasping leaves, and ending in a spray of many minute white flowers. The smooth, slender pods are more or less twisted. Flowers in June and July.

Scurvy-grass (*Cochlearia officinalis*).

SCURVY-GRASS was so called on account of its former prescription as the antidote to the scorbutic troubles of our seafaring folk, who had to rely chiefly upon salted provisions for their lengthy voyages. To-day, the functions of Scurvy-grass are discharged more efficiently by the addition of lemons and lime-juice to a more liberal menu. Formerly, it was considered that we had but one species that varied according to the conditions under which it was growing; but in recent years more intensive study has persuaded some of the authorities that the variations are permanent and sufficiently marked to justify raising the plants to the rank of species: so that five are now found on our lists. These are:

Common Scurvy-grass (*Cochlearia officinalis*), a biennial or perennial herb, growing about sea-shores, with several smooth and fleshy stems from four to ten inches high, ending in a spray of small white four-petalled flowers, each a third of an inch across. The radical leaves are more or less heart-shaped, varying to round and kidney-shaped, with long stalks. The stem-leaves are stalkless, clasping the stem, and lobed or toothed. The seed-pods are nearly round, tipped with the very short style, and the valves are netted (Plate 15).

Alpine Scurvy-grass (*Cochlearia alpina*), is a similar but more slender plant with smaller leaves, and the pod is two or three times as long as broad, tapering at each end. It is found only on mountains, where it ascends to nearly 4,000 feet.

Danish Scurvy-grass (*Cochlearia danica*) has all the leaves

3 *Pl.* 20 **Common Pearlwort.** (p. 21). *B* 16.

Sagina procumbens. CARYOPHYLLACEAE.

3 *Pl.* 21. **Heath Pearlwort** (p. 21). *C.* 17.

Sagina subulata. CARYOPHYLLACEAE.

with stalks, though those of the uppermost are very short. The radical leaves are more triangular, but these may be missing when the plant is flowering. The swollen pods are of similar shape to those of *alpina*. Muddy and sandy shores : less frequent in Scotland and Ireland.

English Scurvy-grass (*Cochlearia anglica*) is a much larger plant than *officinalis*, with stems a foot to a foot and a half long, the leaves narrower and more fleshy, without the heart-shaped base of the other ; the flowers larger, and the inflated, oblong pods twice the size, compressed from the sides and with a longer style. Muddy shores in England and Scotland ; rare in Ireland.

Northern Scurvy-grass (*Cochlearia grœnlandica*) is a small, tufted plant with many fleshy, roundish-kidney-shaped radical leaves, found only in a few localities by the sea in the north of Scotland and Co. Donegal.

The flowering time of all these species is between May and August.

The Latin name *Cochlearia* refers to the spoon-shape of the lower leaves. The genus is included in the family Cruciferæ.

Pepperwort (*Lepidium campestre*).

In the waste corners of fields on dry soils and along many roadsides, we may find the Field Pepperwort fairly common in England, though it is rare in both Scotland and Ireland. It is a biennial herb that, in general appearance, may be confused with Penny-cress or Shepherd's-purse (both described in our First Series) : in truth it may be said to come between the two (Plate 14).

The spoon-shaped radical leaves, whose edges may or may not be cut into lobes, form a rosette, from whose centre the stem rises erectly for about six inches, then divides into

a number of branches, bringing the height of the plant to a foot or more. The stem-leaves are downy, stalkless arrow-heads whose diverging barbs clasp the stem. The white, cruciferous flowers with yellow stamens are only a tenth of an inch across, but they form close clusters at the tip of each branch. From May to August these clusters maintain their size and freshness, for as the outer flowers develop into pods, new buds are formed at the centre. The pods are flattened ovals, a quarter of an inch long, with stalks that are longer standing out at right-angles from the branch, more horizontally than those of Penny-cress.

Smith's Pepperwort (*Lepidium heterophyllum*) is a similar plant, sometimes regarded as a sub-species of the foregoing. It is, however, more hairy, and being a perennial produces several stems, which are branched from the base. The flowers have violet anthers, and the pod is never hairy; seeds much smaller. It occurs about fields and hedgebanks, and is as widely distributed as the Field Pepperwort.

Narrow-leaved Pepperwort (*Lepidium ruderale*) is a rare, evil-smelling annual, found in waste places, mostly near the sea; flowering in May and June. The branching stem, which may be as much as a foot long, is sometimes erect, sometimes prostrate. The lower leaves are cut in from the sides into slender segments which are divided again. The upper leaves are narrow and undivided, smooth or only slightly downy. The flowers are usually without petals, and have only two stamens. The small, winged pods are only slightly notched.

Dittander (*Lepidium latifolium*) is a large, rare perennial, found in salt-marshes from the north-east coast round to Wales, and in southern Ireland. The long rootstock sends out trailing shoots, and the much-branched, leafy stem grows erectly to a height of three or four feet. The radical

3 *Pl.* 22.

Sea Sandwort. (p. 23).
Honkeneja peploides. CARYOPHYLLACEAE.

C 18.

3 *Pl.* 23. **Sea Sandwort.** (p. 23). *C* 19.
Honkeneja peploides. CARYOPHYLLACEAE

leaves are oblong, stalked, and with toothed edges: they may be a foot long. The stem-leaves are more lance-shaped with a few teeth, the upper ones stalkless. The white flowers (July, August) are minute, in close clusters, and the tiny pods are without wings or notch.

Garden Cress (*Lepidium sativum*), extensively grown with Mustard as a salad, may sometimes be found in the wild as an escape from gardens.

The name *Lepidium* is Greek, and refers to the scaly appearance of the pods in this genus of Cruciferæ.

Awlwort (*Subularia aquatica*).

This remarkable plant is little known to flower-lovers by reason of its restricted distribution and its habit of growing completely submersed. It comes no farther south than North Wales, where it is found in the sub-alpine lakes, as also in those of Cumberland, Scotland and Ireland. It grows in the gravelly bottom of the lake margin, where the water is shallow, the small rootstock hidden by the tangled mass of long fibrous, white roots, above which, without any stem, is a close tuft of upright, thick, awl-shaped leaves, from an inch to three inches long and of cellular structure. From amid these rises the slender flower-scape to a similar height, bearing a few tiny white flowers with four petals, four sepals, six stamens and two carpels. Usually the flowers are submerged entirely, when they appear not to open, though they fertilize themselves and produce small roundish pods with a few brown, dotted seeds. If the scape reaches to the air, the flowers expand, and cross-fertilization may take place. The flowering is in June and July (Plate 16).

The Latin name *Subularia* has reference to the awl-shape of the leaves, like the English name.

Sea Rocket (*Cakile maritima*).

THIS rather straggling, bushy annual of the cruciferous family is to be found on all our coasts where the shore is sandy. The stem divides early into long, fleshy, zigzag branches that may be two feet long and are only half-erect. The narrow-oblong leaves, which also are fleshy, have their margins cut into a few blunt lobes. Both branches and leaves have a glaucous "bloom." The flowers, which appear in June and July, are in small clusters at the ends of the branches: they are about half an inch across, the four petals of a lilac tint sometimes so pale as to appear white at a distance. They are succeeded by four-angled pods an inch long, with a sword-shaped tip to the upper of the two joints. There are no valves, and only the upper joint perfects its single seed (Plate 17).

Like other of the plants that grow in the hot, dry sands of the upper shore, the Sea Rocket has a very long tap-root that enables it to draw moisture from the wet depths. *Cakile* is said to be an old Arabic name for the plant. There are no other British species.

Sea-Kale (*Crambe maritima*).

THOUGH found on the sandy shores of the three kingdoms, the Sea-Kale is a rare plant. This is due in many cases to the perennial rootstock being dug up and transferred to gardens, where the young shoots are blanched as a substitute for Asparagus. Occasionally it may be found away from the sand or shingle, as at Beachy Head, Sussex, where in very recent years it has climbed the great chalk cliffs and established itself, chiefly in trenches made in wartime.

It has a long, fleshy, burrowing rootstock, an inch thick,

3 *Pl.* 24. **Saltmarsh Sand-Spurrey.** (p. 25). *C* 20.

Spergularia marginata. CARYOPHYLLACEAE.

3 *Pl.* 25. **Sea Kale.** (p. 20). C 21.

Crambe maritima. CRUCIFERAE.

from which arise spreading stems a foot or two feet long, with splendid oblong heart-shaped leaves of a glaucous tint, fleshy, and with the margins lobed and thrown into many folds. Even before it begins to flower (at the end of May), it is a handsome and striking plant, the radical leaves lying along the ground to a length of a couple of feet. On the stout flowering stems, the leaves are, of course, much shorter, but much lobed and crisped (Plates 18, 19, 25).

The flowers, which continue till August, are borne in great, many-branched clusters a foot across : the individual flower being half an inch, and white with yellow stamens and a purple pistil. The stamens should be examined. At the base of the longer ones there are large, dark-green nectaries, and the filaments of the same pairs have a spur on the inner side, which serves to keep the anther away from the stigma.

The large Common Garden-snail (*Helix aspersa*) is very partial to this plant, and may be found in numbers under the leaves. *Crambe* is the old Greek name for the plant.

Common Pearlwort (*Sagina procumbens*).

THE Pearlworts form a genus of the Pink family, and are among the smallest of our flowering plants. Owing to the minuteness of their parts, it is not an easy matter for the amateur to discriminate between the five or six long recognized species—which the modern specialist reckons at twice that number—and though the one we have selected as a type is common throughout the country few people know it by its name (Plates 20, 21).

Common Pearlwort is a perennial that forms a low tuft or mat by means of a number of trailing and rooting branches that spread from the base of the primary, flowerless stem. The awl-shaped leaves are in pairs united at their base and ending in a fine hair-like point ; they are

about a fourth of an inch long. The numerous small flowers are borne singly on separate delicate stalks, and the parts are usually in fours, occasionally increased to fives: four sepals, four much smaller white petals (sometimes wanting), four stamens and four curved styles. These may be found from May to September. After pollination, the tip of the stalk curves, so that the flower hangs downwards; but straightens again when the capsule (which is longer than the sepals) is ripe. At this stage the sepals spread widely from below the capsule. The plant may be found in all sorts of waste places, pastures, banks; and is a great annoyance to the tidy gardener from its fondness for invading his gravel-paths.

Annual Pearlwort (*Sagina apetala*) is a less common species, as a rule affecting drier situations, such as banks and the tops of walls, but flowering at the same period as the Common species. It may be known by its stem being more or less erect and flowering, whilst the branches ascend instead of lying along the ground and rooting. It varies from four to ten inches in height. The leaves are similar to those of *procumbens*. Sometimes it has glandular hairs on the upper part of the stem, the flower-stalk and the calyx. The petals are very minute, wedge-shaped, often absent entirely. The sepals are shorter than the ripe capsule, from which they spread widely.

Sea Pearlwort (*Sagina maritima*) is an annual found on sandy seashores, which some consider to be a form or subspecies of the last-named and owing its differences to its habitat. The central stem is erect and forked; the branches ascending, with the internodes longer. The leaves are more fleshy and have rounded backs. The sepals are about equal to the ripe capsule, from which they part only slightly. The brittle stem is often tinged with purple.

More common than the last-named, and the largest and

3 *Pl* 26. **Marsh Mallow.** (p. 26). *C* **22.**

Althaea officinalis. MALVACEAE.

3 *Pl.* 27. **Rock Sand-Spurrey.** (p. 25). *C* 23.

Spergularia rupicola. CARYOPHYLLACEAE.

most conspicuously-flowered of our Saginas, is the Knotted Spurrey or Pearlwort (*Sagina nodosa*), a perennial which grows upon wet heaths and in moist, sandy places, flowering in July and August. The primary stem remains short and does not flower, but from its base are produced a number of long branches, from four to ten inches long, which, at first leaning on the ground and rooting from their joints, curve upwards and grow almost erectly. The awl-shaped root-leaves are half an inch long, but those from the branches are from a quarter to half that length and from their axils issue tufts of smaller leaves which produce the knotted appearance that gives the species its name. The erect flower-stalks are often two or three together at the summit of the upright branches, giving greater prominence to the flowers. These are a quarter of an inch across, their parts in fives and the white petals longer than the sepals ; there are ten stamens.

The name of the genus is Latin and indicates fattening meat or food suitable for cramming. When Linnæus adopted the name for these small plants he must have " wrote sarcastick."

Sea Sandwort (*Honkeneja peploides*).

It is unfortunate that, in many books, this plant is entitled the Sea Purslane, a name that belongs of right to *Obione portulacoides*, a plant related to the Goosefoots and Oraches, whereas *Honkeneja* is a member of the Pink family (Caryophyllaceæ). It is a common perennial all around our islands, wherever the shore is sandy or pebbly, often forming extensive carpets which the dark shining green colour of the fleshy leaves and stems renders conspicuous. It is often instrumental in collecting low heaps of sand that grow ultimately into dunes (Plates 22, 23).

There is a creeping rootstock, from which arise forking stems that lie on the ground, whilst their branches arise to a height of only six or eight inches. The oval leaves, which have horny margins, are stalkless, arranged in pairs and each pair is at right angles with those above and below it, their tips curved back. As a rule, there is little advertisement from the small greenish-white flowers, which expand only in the morning sunshine—from May to September.

These flowers, which may be solitary or two or three together, have short stalks arising from the axils of the leaves, and are about a quarter of an inch across. They have five blunt oval sepals with thin margins, five petals, ten stamens alternately long and short, and the pistil has three or five styles. This is the complete bisexual flower: but it will be found that some flowers have no stamens and that others are without a pistil, rendering them unisexual. Of these, it will be seen that the males have sepals and petals of equal length, whilst in the females the sepals exceed the petals. The large round seed-vessels are more striking than the flowers. They contain only a few large, black, pear-shaped seeds.

Along the Yorkshire coasts, the stems and leaves are—or were—used to make a pickle. The name of the genus commemorates a German botanist, G. A. Honckeny. By some authorities the plant is placed in the genus *Arenaria*.

Rock Sand-spurrey (*Spergularia rupicola*).

Of our four native species of Sand-spurrey, one, the Red Sand-Spurrey, is distributed widely over England and the greater part of Scotland, but is rare in Ireland: appearing in gravelly and sandy soils inland; but the other three are distinctly plants of the seaside. All four are so nearly alike

3 *Pl.* 28. **Tree Mallow.** (p. 27). *C* 24.
Lavatera arborea. MALVACEAE.

3 *Pl.* 29.

Water Purslane. (p. 30).
Peplis portula. LYTHRACEAE.

3 *Pl.* 30. **Goutweed.** (p. 31).
Aegopodium podagraria. UMBELLIFERAE

3 *Pl.* 31. **Lady's Mantle.** (p. 28) *C* 25.
Alchemilla vulgaris. ROSACEAE.

and so variable that doubts have been raised whether they are good species or forms (sub-species) of one, owing their differences to their diverse habitats. Two are annuals or biennials, and two perennials.

Rock Sand-spurrey (*Spergularia rupicola*) is the least common of the four, found in rocky and shingly places near the sea. It is a perennial, with a thick, woody rootstock and spreading stems clothed with glandular down. The short, clustered leaves are half-cylindrical, fleshy, with pointed tips; the stipules broad ovals. The neat little flowers are about a third of an inch in diameter, and may be found, like those of the other species, from June to September. There are five sepals which are shorter than the pink petals; ten stamens and an ovary with three styles. The three-valved seed-capsule is equal in length to, or slightly longer than, its footstalk. The seeds are flattened pear-shaped, with a thickened border (Plate 27).

Salt-marsh Sand-spurrey (*Spergularia marginata*) is a less rare perennial, found in muddy salt-marshes. The stems are flattened from the sides, and the plant usually is smooth, but there is one form which is covered with dense glandular down. The fleshy leaves are half-round in section, but have blunt tips; and the stipules are broadly triangular. The petals are equal in length to or slightly less than the sepals: pale lilac or nearly white. There are ten stamens. The capsule is one and a half to twice the length of the sepals, and the reddish seeds have a broad wing (Plate 24).

Shore Sand-spurrey (*Spergularia salina*), which is of similar frequency to *marginata*, is an annual or a biennial, found in muddy and rocky places near the sea. It has a small rootstock, with several stout compressed stems, more or less glandular-downy. The half-round leaves are drawn out to a long point, and the stipules are dark and triangular. The petals are shorter then the sepals, purplish-

rose with a white base. Usually, there are fewer than ten stamens; and the capsule is longer than the sepals, the brown seeds wingless except a few at the base of the capsule.

Red Sand-spurrey (*Spergularia rubra*) is also annual or biennial, and is much more frequently to be met with, being found on dry, sandy and gravelly soils inland as well as near the coasts. It is much smaller than either of the other species. The almost round stem divides at the base into numerous branches. The slender leaves are not fleshy, but flat with sharp tips; and the silvery white stipules are lance-shaped, joined at the base and with torn edges. The flowers, which may be solitary or in small clusters, are only a quarter of an inch across, with the rosy petals equal to or slightly shorter than the sepals. There are five or ten stamens. The capsule is shorter than its stalk, and the knobbed seeds have a thickened margin but no wings.

Marsh Mallow (*Althæa officinalis*).

To many inland persons the Common Mallow of our dry wastes and waysides is known as Marsh Mallow, though a little thought should convince them that the usual places of its growth make such a designation inappropriate. The two genera are related very closely, and in all the essentials of structure the plants agree; yet the species have characters which distinguish them readily (Plate 26).

Marsh Mallow is a perennial of only local occurrence, in marshes near the sea, chiefly in England and Ireland; rare in Scotland, and then always south of the Clyde. Both stem and leaves have a velvety coat, whose softness distinguishes it from the rougher hairiness of the Malvas. The simple or slightly branched stems are from two to three feet high. The large, thick leaves are oval heart-shaped or roundish, divided usually into three or five lobes, which

3 *Pl.* 32. **Wall Pennywort.** (p. 30). *C* 26.
Cotyledon umbilicus. CRASSULACEAE

3 *Pl.* 33. **Wall Pennywort.** (p 30). *C* 27.

Cotyledon umbilicus. CRASSULACEAE.

have coarsely-toothed edges. The flowers are produced in small clusters from the axils of the stem-leaves, and are of a pale rose-tint, appearing in August and September.

If the flower is turned over, a small distinction from the structure in *Malva* will be evident. The outer calyx (epicalyx) has here from six to nine divisions, instead of the three which suffice for *Malva*. There are five lobes to the calyx, five petals attached to a tube consisting of the connected filaments of the many stamens. Through this tube protrude the numerous styles. The fruits form a ring of one-seeded carpels, like the "cheese" of the Common Mallow.

A second and smaller species, the Hispid Marsh Mallow (*Althæa hirsuta*), probably an ancient introduction from the Continent, has been considered as possibly native in Somerset, and has been long naturalized in north-west Kent. It is an annual, with numerous slender, semi-erect stems, a foot or more long, and heart-shaped or kidney-shaped leaves with three or five lobes and rounded teeth. The rose-purple flowers are solitary and about an inch across, appearing in July and August. Stem, leaves and calyx are covered with bristly hairs.

Marsh Mallow has undoubted demulcent properties, soothing to irritated mucous membranes; but formerly it was considered to have far more extensive curative powers, and the Greek word *Altheo*, healing, was chosen for its name on this account.

Tree Mallow (*Lavatera arborea*).

Along the south and west coasts of England, on the Bass Rock in the Firth of Forth, and rarely on the Irish coast, the rambler may have the good fortune to come across this remarkable plant growing from crevices in the rocks.

But it is much more rare as a wild plant than it was formerly, and it is now more likely to be seen in allotments or gardens on the cliffs, to which young plants get transferred when they appear among the rocks (Plate 28).

It is well-named Tree Mallow, for it has an erect, branching, woody stem from three to six feet high (in garden ground it may be eight feet), and three or four inches thick. The large, long-stalked, velvety leaves are roundish in general outline but cut into five or seven lobes which have rounded teeth; they are also plaited, the folds running from the stalk along the middle of each lobe and a reversed fold to the indent between the lobes. From the axils of the leaves are produced annual flowering shoots, which, from July till September, bear numerous bright blossoms.

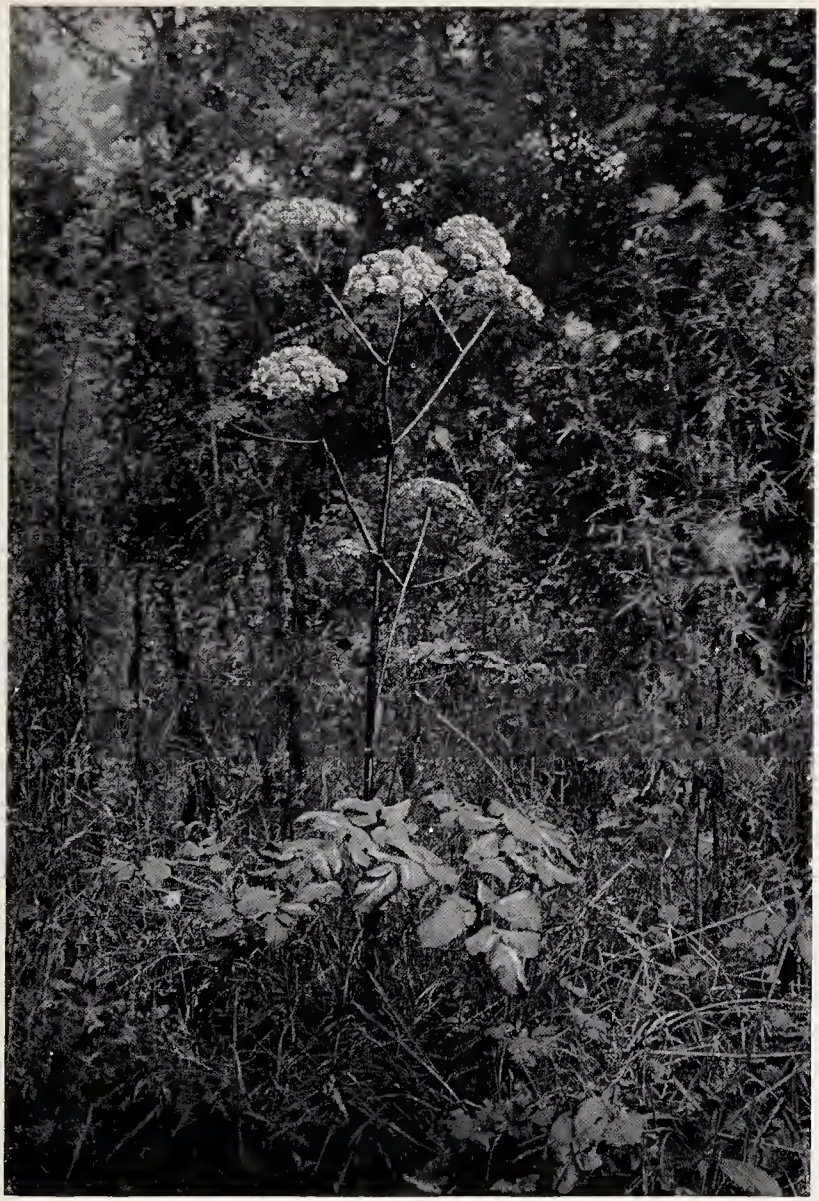
The flowers are an inch and a half across, much like those of the Common Mallow and similar in structure, the epicalyx having three large oval lobes. The glossy petals are rosy purple, veined with a darker purple. The fruits are arranged in like manner to those of the Marsh Mallow.

The genus was named in honour of the brothers Lavater, Swiss physicians, by their friend Tournefort.

Lady's Mantle (*Alchemilla vulgaris*).

Although the Lady's Mantle offers little attraction by way of its tiny yellow-green flowers, its large, handsome radical leaves are beautiful in form and make the plant conspicuous. It is a perennial herb of the Rose family, found in moist pastures and the neighbourhood of streams, especially in hilly localities (Plate 31).

From a short, thick rootstock the radical leaves spread on very long leaf-stalks: the leaves roundish or kidney-shaped cut into seven or nine lobes, which have toothed



3 *Pl.* 34 **Angelica** (p. 32). *C* 28.

Angelica sylvestris. UMBELLIFERAE

3 *Pl.* 35. **Angelica.** (p. 32). *C.* 29.

Angelica sylvestris. UMBELLIFERAE.

edges. Each lobe is folded along the middle; and this pleating combined with the pinked edges suggested the name—originally *Our* Lady's Mantle. The slender stem, a foot to eighteen inches long, is at first decumbent, then the younger portion assumes a more upright direction. The stem-leaves are smaller and stalkless. The upper part of the stem branches into clustered sprays of very small flowers which have no petals; June to August. The pitcher-shaped calyx has five lobes and as many little bracts. Usually, there are four perfect stamens attached to the mouth of the calyx. Nectar is secreted by a fleshy ring in the calyx-tube, and induces the visits of flies by which cross-pollination is effected.

Alpine Lady's Mantle (*Alchemilla alpina*) is a smaller perennial, found only in the mountainous parts from Yorkshire northwards and in Ireland, at altitudes not lower than 400 feet and reaching to 4,000 feet, its abundance often making it a very conspicuous feature of the alpine grass-slopes. It is very distinct from the common species, the leaves, instead of being merely lobed, are cut to the base into five or seven narrow oblong leaflets, which are toothed only at the tips; the underside is clothed with white silky hairs, which gives it a silvery appearance. The flowers (June to August) are similar in character and colour to those of *vulgaris*, but a fourth smaller.

Parsley Piert or Field Lady's Mantle (*Alchemilla arvensis*) is a common plant in fields and wastes on gravelly soil throughout the country. It is regarded generally as an annual, but its root system and the woody character of its short stem appear to indicate a longer duration. The stem branches extensively just above its base, and the leafy branches, three or four inches long, spread in all directions, rising but slightly from the ground. The small leaves have very short stalks, are fan-shaped and cut into three wedge-

shaped lobes with toothed tips. The minute green flowers are in close clusters of about six opposite to a leaf, by whose stipules they are almost hidden. The whole plant is delicately hairy.

The name of the genus is of Arabic origin, and has reference to the former use of the plants by the alchemists.

Water Purslane (*Peplis portula*).

THOUGH the Water Purslane is a tolerably common annual in most parts of the country, it cannot be described as well-known, owing to its being passed over as unworthy of attention, the petals of the tiny flowers being often wanting (Plate 29).

It grows in the wet ground around ponds and in moist hollows, where its smooth, prostrate stems, four-angled and red, spread around and root occasionally from the underside. The oval leaves, which are in pairs, narrow into short stalks ; and in their axils are produced the solitary, almost stalkless, purplish flowers. These consist of a bell-shaped, twelve-ribbed calyx, whose margin has twelve teeth, six of them broad and erect, the other six alternating with them, awl-shaped and spreading. The small petals are either wanting when the flower opens, or fall soon after. The plant is in flower during July and August. This is the only British species.

The name *Peplis* was applied by the Greeks to the cultivated Purslane, and got transferred to the present genus, which is included in the family Lythraceæ.

Wall Pennywort (*Cotyledon umbilicus*).

WITHOUT the distinctive " Wall " this plant is likely to be confused in popular nomenclature with the Marsh Penny-

3 *Pl.* 36. **Wild Parsnip.** (p. 33). *C* 30.

Pastinaca sativa. UMBELLIFERAE.

3 *Pl.* 37. **Hedge Parsley.** (p. 34). *C* 31.
Torilis anthriscus. UMBELLIFERAE.

wort of the umbelliferous family. An alternative name is Navelwort; and in Cornwall it is known as Penny-pies. Where it occurs, it is usually in abundance, springing from the crevices of rocks and those of the stone-built hedges. Its distribution is mainly along the western coasts of England and Scotland as far north as Argyll, and in Ireland. It extends more sparingly along the south coast, getting as far east as Kent (Plates 32, 33).

It is a perennial herb of the Stonecrop family (Crassulaceæ), and as such has a general succulence, though less pronounced than in most members of the family. There is a tuberous rootstock, from which springs a loose cluster of thick circular leaves on long stalks. The footstalk is attached to the centre of the leaf, whose upper surface has a deep depression at that point; it is two or three inches across and has the margins variously notched. Amid these radical leaves rises the flowering stem, which bears leaves of different shape: the lower ones spoon-shaped, the upper wedge-shaped. The stem, ordinarily a foot to two feet high, may lengthen to three feet, closely set all round with drooping greenish-white flowers: May to August.

The flower consists of five sepals connected at their base, a long tubular corolla with the mouth four- or five-lobed, and within ten stamens and five pistils with thread-like styles. There is a glandular scale at the base of each pistil.

The name of the genus is from the Greek *kotyle*, a cavity, in reference to the hollowed leaf.

Goutweed or Bishop's-weed (*Ægopodium podagraria*).

ALTHOUGH this umbelliferous perennial—alternatively Goatweed—is distributed widely throughout the country, and in some places is found in very great abundance and

luxuriance, it is not regarded as being a true native. Two principal facts have led to this view that it is a naturalized alien: it is never found far from human habitations, and in former times it was cultivated extensively in gardens on account of its reputed medicinal qualities (Plate 30).

From a very long, creeping white rootstock, which has an aromatic odour and a pungent flavour, it sends up grooved, hollow stems about two feet high, with large triangular leaves broken into three leaflets which are divided in like manner. The stem branches above, and each branch bears a compound umbel of pure white flowers: June to August. The calyx is without teeth; the five petals are broad but unequal, the tips turned up and over. The flattened oval fruits have no oil-tubes between the ridges.

The genus name is from two Greek words signifying goat's-foot, three small leaflets being supposed to resemble the print of the animal's foot. Other English names are Herb Gerarde and Ashweed.

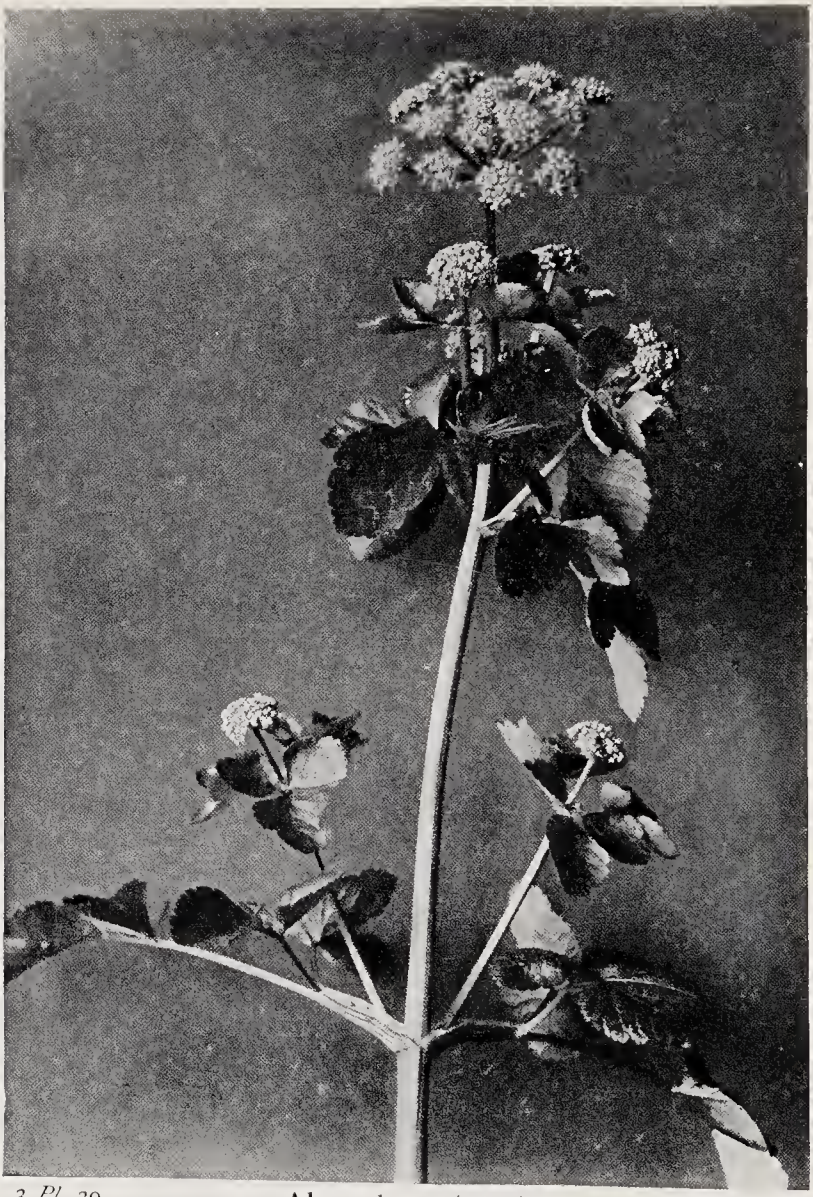
Angelica (*Angelica sylvestris*).

This exceedingly handsome perennial is a member of the family Umbelliferæ, and may be found in copses, on the margin of damp woods and in the near neighbourhood of streams and watercourses throughout the country, flowering from July to September. Its full beauty is marred often by starting life under bushes and undergrowth, which prevents the unhindered expansion of its fine leaves.

It has a stout, hollow stem, ordinarily five or six feet high, but under favourable conditions it may attain to eight or nine feet; it is tinged with purple, and smooth to the touch, in spite of fine grooves and ridges. The triangular leaves, two or three feet long, have stout stalks which are expanded greatly where they embrace the stem. Like those of most

3 *Pl.* 38. **Mistletoe.** (p. 36). *C* 32.

Viscum album. LORANTHACEAE.



3 *Pl.* 39. **Alexanders.** (p. 35). *D* 33.

Smyrnium olusatrum. UMBELLIFERAE.

umbellifers, the leaves are broken up into several paired divisions, and these are divided again into three pairs and an odd one of egg-shaped or lance-shaped leaflets with toothed edges (Plates 34, 35).

Above the leaves, the stem divides into straight branches, each ending in a large compound umbel of white or pale purple flowers. Each simple umbel has a rounded top, and the arrangement is such as to give a similar convexity to the compound inflorescence. The petals are nearly equal, giving a regularity to the flower ; soon after opening, the long stamens are rather more conspicuous than the petals.

The fruit consists of two compressed oval carpels, whose outer ridges are expanded to form wings ; in the intervening furrows of the three inner ridges are oil-tubes. The bitter and aromatic properties of the plant caused it to be invested with a reputation for wonderful curative powers, hence its Latin name ; though these were thought to be possessed in a greater degree by the cultivated *Archangelica*, whose candied leaf-stalks are still prepared by the confectioners as an aid to digestion.

Wild Parsnip (*Pastinaca sativa*).

THE Wild Parsnip should have a special interest for us as being one of the plants that man taught long ago to yield him nourishing food by the enlargement succulently of its rather wiry root ; for the wild umbellifer that is so abundant on some of our wastes is the actual species that yields huge, tender, elongated cones in the deep rich soil of the kitchen-garden (Plate 36).

Wild Parsnip is regarded as being a true native only in England ; in Ireland doubtfully, and in Scotland the wild plants are the descendants of those escaped from cultivation.

In England many of the plants found near fields and villages have had, probably, a similar origin ; but when found in profusion on the wastes overlying chalk, limestone or marl, away from habitations, it may be assumed to be the real wild plant.

It is a biennial, with a stout, furrowed and hollow stem, from two to five feet high, with large, stalked leaves that are cut into three or more pairs of bold-toothed oval leaflets that are glossy above and downy beneath. The upper part of the stem bears many curving branches, each ending in a compound umbel of small, bright yellow flowers : July and August. The fruits are flat, broad-oblong, with slender ridges and dilated margins : an oil-tube in each furrow.

Pastinaca is the old Roman name for the Parsnip, from *pastus*, referring to its food value.

Hedge Parsley (*Torilis anthriscus*).

When Beaked Parsley and Wild Chervil have finished their flowering, the succession is taken up along the hedge-banks by the similar, though smaller umbels of Hedge Parsley. For this reason, though equally common with the plants named, it is not nearly so well-known, being passed as a small and belated example of one of them.

It is an annual herb, found on the banks and under hedges throughout the country, flowering from July to September. The stem, from two to three feet high, is solid, finely grooved, and covered with hairs that turn downwards. It is branched above, each branch terminated by a compound umbel of minute white or pink flowers, with four or six awl-shaped bracts beneath it. The hairy lower leaves are broken up into several oval-lance-shaped leaflets, which are cut into lobes and large teeth ; the upper

3 *Pl.* 40. **Wild Madder.** (p. 38). *D* 34.

Rubia peregrina. RUBIACEAE.

3 *Pl.* 41. **Wild Madder.** (p. 38). *D* 35.

Rubia peregrina. RUBIACEAE.

leaves at the base of the branches are simpler, of three leaflets or one, slender and deeply toothed (Plate 37).

The fruits are oval, covered with awl-shaped spines.

There are two other species, smaller and much less common. They are:

Knotted Hedge Parsley (*Torilis nodosa*), found on banks and dry wastes, chiefly in the south and in Ireland, flowering earlier (May to July). Its slender, wavy stem is less upright (often prostrate), varying from six inches to a foot and a half in length. The leaflets are very small, cut deeply from the sides. The small, but regular, pink flowers are in almost globular simple (not compound) umbels that are nearly stalkless. The spines of the minute, oval fruits are hooks with barbed tips.

Spreading Hedge Parsley (*Torilis arvensis*) is restricted to fields and wastes in England only, not reaching there into the most northern counties. It is an erect, much branched, bristly annual, not much more than a foot in height, and often half that length. The stem is solid, angled and leafy. The leaves are divided into narrow oblong leaflets which are cut into toothed lobes from the sides. The small, irregular, white or pink flowers are in compound umbels on long stalks: July to September. The dense prickles on the oblong fruits have hooked tips.

Alexanders (*Smyrnium olusatrum*).

WIDELY as the distribution of this large, biennial umbellifer is spread over the country, with the exception of mid and north Scotland, it is met with chiefly near the sea, where often it is in great abundance. Inland, it is frequent about old buildings, where it suggests descent from plants that were cultivated in the ancient gardens when its young and tender shoots were esteemed for table use. The intro-

duction of Celery, which it resembles somewhat in odour and flavour, destroyed its popularity (Plate 39).

Alexanders or Alisanders has a stout, round and grooved, solid stem, from two to four feet high, crowned by dense, rounded, compound umbels of greenish-yellow flowers: April to June. The radical leaves, found chiefly in first-year plants, are very large and glossy, the base of the stalks expanded into broad sheaths, and the blade divided into leaflets which are again cut into three oval and toothed segments. The stem-leaves are smaller and simpler, being divided into only three parts.

The individual flowers of the great umbel conform to the usual umbelliferous type, the calyx inconspicuous and the petals with the tips turned over towards the carpels. The fruit is oval, dark brown; the carpels with three prominent ribs, between which are numerous oil-ducts.

Smyrnium is the old Greek name for the plant, from *smyrna*, myrrh, in allusion to its odour.

Mistletoe (*Viscum album*).

A DESCRIPTION of the pearl-berried Mistletoe for the purpose of identification is certainly unnecessary; yet a few facts concerning it may be acceptable. It is the only British representative of the large family Loranthaceæ, which is composed mainly of evergreen semi-parasitic shrubs like our own species. The seed germinates in a crevice of the bark of the host tree, and the root takes the form of a sucker which penetrates the wood and branches among the tissues (Plate 38).

The short stem and its branches are round in section, clothed with a smooth yellow-green bark; the branches fork repeatedly, and bear at their ends usually a pair of leathery leaves, but sometimes there are three. These are

3 *Pl.* 42. **Sea Aster.** (p. 39). *D* 36.

Aster tripolium. COMPOSITAE.

3 *Pl* 43. **Woolly-headed Thistle** *(1st year)*. (p. 43). *D* 37.
Cnicus eriophorus. COMPOSITAE.

two or three inches long, with a broad, rounded tip, from which the leaf tapers to the pointed base. One plant is male, another female; and the leaves of the male plant are broader than those of the female. It flowers from March to May.

There is little in the small, yellowish flowers to call attention to them; they will be found at the forking of the branches or between the leaf-bases. The males are usually in clusters of threes; the females may be in fives. There are four thick sepals, united to the calyx-tube, to which in the males are attached a corresponding number of dotted anthers—there being no filaments. In the females, the one-celled ovary is below the calyx, and has a simple stigma without a style. This and the receptacle develop into the so-called berry, pearly-white and about a third of an inch across, containing a single seed embedded in viscid pulp, which takes more than a year to ripen.

The flowers produce nectar, which renders them attractive to bees and flies, by which the pollen is transferred from bush to bush; and the shrub is indebted to birds for the distribution of its seeds. Their viscid coat makes them difficult to swallow, and they are rubbed off the bird's bill against the bark of a tree, to which they adhere firmly until germination takes place, in the position necessary for the plant's development.

In the wild, the Mistletoe is most likely to be found growing upon Poplar and Apple; various other trees are parasitized by it, but there are very few reliable records of its occurrence on the Oak, in spite of druidical legends to the contrary. The Mistletoe of the Oak was probably an allied S. European plant, the *Loranthus europæus*. The abundance of Mistletoe in some orchards is due, in most cases, to the enterprise of the owners, with an eye on the Christmas markets.

As a wild plant, it is found chiefly in the South and West of England; it does not occur in either Scotland or Ireland.

Wild Madder (*Rubia peregrina*).

Our only native species of *Rubia* was called *Wild* Madder to distinguish it from another species (*R. tinctorum*), which was cultivated extensively for the sake of its roots, which yielded the valuable dye-stuffs from which was obtained Turkey-red, Madder-brown and Madder-yellow—now produced synthetically. The roots of Wild Madder contain the same colour-principle (alizarin), but in less strength.

Wild Madder is a perennial herb of the family Rubiaceæ, with a restricted range in this country, its northern limit being Wales; it occurs also in the shires of Hereford and Gloucester, and—chiefly—in the counties bordering the English Channel. In Ireland, it is found in the south and east. It inhabits rocky and bushy places not far from the sea, where it scrambles over other vegetation and among the loose rocks. It may be known by its general resemblance to the larger of the Bedstraws (*Galium*), from which it differs in its larger, broader and shining stiff leaves and their deeper green or bronzy colour. As it is an evergreen, these leaves may be found all the year when the Bedstraws have all disappeared (Plates 40, 41).

The old stems, woody below, are round and two or three feet long; but the spreading side shoots are four-angled, with deep furrows between the angles. The leaves are produced in distant whorls of four to six; in shape they are elliptic or lance-shaped, their margins armed with prickle-teeth which are directed backwards. Similar prickles will be found along the midrib on the underside; also on the angles of the stems.

3 *Pl* 44 **Golden Rod.** (p. 40). *D* 38.

Solidago virgaurea. COMPOSITAE.

3 *Pl.* 45. **Smooth Hawk's-beard** (p. 46). *D* 39.
Crepis capillaris. COMPOSITAE.

The minute yellow flowers are in loose clusters at the ends of the shoots and in pairs from the axils of the leaves : each consists of a rotate, five-lobed corolla, with five short stamens alternating with the lobes. The pistil has two styles with knobbed stigmas ; instead of developing into a dry prickly fruit, as in the allied Bedstraws, it becomes succulent and black. The flowers may be found from June to August ; although so small, they are collectively a very noticeable feature of the plant.

The name of the genus is from the Latin, *ruber*, red in reference to the red dye obtained from the roots.

Sea Aster or Starwort (*Aster tripolium*).

THE rambler along any of our coasts who comes upon a salt marsh in late summer, will, in most places, see a plant whose bright purple-violet flowers remind him strongly of the Michaelmas Daisies of the gardens. This is the only British member of the Michaelmas Daisy genus.

It is a perennial herb of the Composite family, with a spindle-shaped root and a stout erect stem, two or three feet high. The long, smooth, fleshy leaves are lance-shaped or oblong, sometimes slightly toothed. Each branch ends in a cluster of fragrant flowers of the Daisy type of structure, a composite head of tubular, yellow disc-florets, surrounded by a single whorl of ray-florets, which vary from purple-violet to almost white. Their season is from July to September. The disc-florets contain both stamens and pistil, but the ray-florets are female only. Each head is about two-thirds of an inch across (Plate 42).

An allied plant of great rarity, the Goldilocks (*Linosyris vulgaris*), is by some authors included in the genus *Aster*. It occurs only on limestone cliffs, and its chief habitat in this country is Orme's Head, Llandudno, but it has been

reported also in Devon and Somerset. It is a perennial, with an unbranched, wiry stem, a foot to a foot and a half high, clothed densely with very slender, dotted leaves, broadest above the middle. At the top of the stem is a dense cluster of yellow flower-heads that have no ray-florets: August and September.

The name of the genus is the Latin word for a star, the rayed flower heads having the conventional starry appearance.

Golden Rod (*Solidago virgaurea*).

ALTHOUGH found throughout the country, where the soil conditions are suitable for its requirements, the Golden Rod is scarcely to be reckoned among our more familiar plants. The congenial situations are the dry oakwood, the heathlands, stony banks and rocky hillsides on a sandy soil.

Golden Rod is a perennial herb of the Composite family, with an erect, slightly angular, smooth or downy stem, from a foot to three feet except when growing up sea-cliffs, when it may be reduced to a few inches. The leaves are lance-shaped, with slightly toothed edges, and arranged alternately on the stem; the lower ones stalked. The upper half of the stem bears numerous short branches, each supporting three or four slender flower-heads, the whole of them constituting a long golden spray, which may be found from July to September (Plate 44).

The lower part of the head is covered by overlapping bracts with thin (scarious) margins; and the golden-yellow ray-florets are few. The darker disc-florets only slightly exceed them in number. The downy fruit has a white pappus.

There is a form (var. *cambrica*) that occurs on mountains, which has the stem only a few inches high, broader leaves and fewer, larger flower-heads.

3 *Pl.* 46. **Bur-Marigold** (p. 41). *D* 40.

Bidens tripartita. COMPOSITAE.

3 *Pl.* 47. **Bur-Marigold.** (p. 41).
Bidens tripartita. COMPOSITAE.

3 *Pl.* 48. **Saw-wort.** (p. 42).
Serratula tinctoria. COMPOSITAE.

3 *Pl.* 49. **Saw-wort.** (p. 42). *D* 41.

Serratula tinctoria. COMPOSITAE.

The name of the genus is from the Latin, *solidare*, to consolidate, in allusion to its former repute as a herb that would heal wounds.

Bur-Marigold (*Bidens tripartita*).

We have two species of Bur-Marigold native in this country, with much the same geographical distribution, including England, Ireland and the South and East of Scotland. They are members of the Composite family, both annuals, and they are found in similar situations—marshes, pond-sides and other watery places—where they may be found in flower from July to October. In general appearance they are very similar, but there are several points sufficing for ready identification.

Trifid Bur-Marigold (*Bidens tripartita*), the species illustrated, has a smooth, rounded, slender stem from a foot to three feet high, branching in pairs from the axils of the paired leaves. These have winged stalks, and the lower ones are cleft into three (sometimes five) segments which have a few large teeth ; the division of the upper leaves is irregular, and some of them are undivided, lance-shaped. The ultimate branches end in a solitary flower-head, consisting of brownish- or greenish-yellow tubular florets with five teeth ; there are no ray-florets. It should be noted that, in this species, the heads may be erect, but mostly are half erect : all surrounded by a whorl of leafy bracts which spread out and make the heads more conspicuous. The ribbed fruits have a pappus of two barbed bristles, which aid in the dispersal of the seeds by catching in the fur or feathers of waterside animals ; it is said that they sometimes cause the death of fishes by clogging their gills or jaws (Plates 46, 47).

Nodding Bur-Marigold (*Bidens cernua*) has a more robust

stem, and the leaves are undivided and without stalks. They are oblong lance-shaped, with coarse teeth along the edges. The bases of a pair unite around the stem. The flower-heads are larger (an inch to an inch and a half broad) than in the other species, and in a rare form (var. *radiata*) there are a few ray-florets. The heads droop, more or less facing the earth. The pappus-bristles are usually four, and they are longer than in *tripartita*.

The name of the genus is Latin, and indicates the two teeth or spikes of the pappus in some species, such as *B. tripartita*.

Saw-wort (*Serratula tinctoria*).

WHILST this perennial Composite cannot be considered uncommon in England, it is entirely absent from some districts. In Scotland it is found only in the most southern part; and in Ireland it is recorded only from rocks by the river Barrow, Co. Wexford. Its usual resorts are among the low bushes on the outskirts of the wood, in copses, thickets, and occasionally on heaths. It may be found in flower from July to September (Plates 48, 49).

The slender, grooved, branching stem is two to three feet long, more or less erect and leafy. The leaves show considerable variation on the same plant: the lower ones being cut deeply from the sides into sharply-toothed lance-shaped leaflets or segments, of which the terminal lobe is the largest and longest. It is from the serrated edges of the leaves that the plant gets its name, both botanical and popular.

The flower-heads are suggestive of those of a small Thistle. In form they are a long egg-shape, covered with closely overlapping bracts, of which the inner are purplish. The florets are red-purple. A comparison of several heads

3 *Pl.* 50. **Woolly-headed Thistle.** (p. 43). *D* 42.
Cnicus eriophorus. COMPOSITAE.

3 *Pl.* 51. **Woolly-headed Thistle.** (p. 43) *D* 43.
Cnicus eriophorus. COMPOSITAE.

will reveal a difference between them : one has blue anthers and the two arms of the style keep close together ; the other kind has white anthers and the arms of the style spread widely apart. The two are respectively male and female, for the blue anthers are filled with effective pollen, the white ones are not ; the spreading style-arms are receptive of pollen, the closed arms not. The rough, oblong fruits are crowned by a tuft of dirty-white pappus hairs.

The Latin name of the species (*tinctoria*) indicates that the Saw-wort is a dye-weed : it was employed formerly for dyeing woollen fabrics yellow.

Woolly-headed Thistle (*Cnicus eriophorus*).

We have given already a condensed description of this Thistle (Series 1, page 148), but inasmuch as from its local occurrence it cannot be so familiar as most of the other species, we have thought that our readers would appreciate a portrait and a fuller account. As a British plant, it occurs only in England, but though its range extends from the county of Durham to the South Coast, within this area its distribution is very patchy, and mostly in the South. This is due to what the scientific botanist calls the edaphic factor—the character of the soil. The Woolly-headed Thistle demands much lime in its food, and it does not grow where the subsoil is not limestone or chalk. So that the flower-lover should consult a geological map of his district before he goes in search of this plant.

The Woolly-headed Thistle is a biennial ; and in its first year it does not form a beautiful rosette like other of the biennial Thistles. Its first fine leaves hold themselves more or less erectly ; and it is a very striking plant already. These root-leaves are from a foot to two feet long and three or four inches wide, cut from the edges almost to the

midrib into a large number of narrow lobes. These are divided again into a pair of lance-shaped segments, of which one turns down and the other up, each ending in a needle-like spine. The upper surface of the leaf is coloured a rich, dark green, and is bristly, whilst the underside is pale with a coating of soft cotton (Plates 43, 50, 51).

In its second year, the plant builds up a furrowed, woolly stem to a height of four, five, sometimes six feet, with many stout branches which are nearly erect, each ending in a cluster of big flower-heads. The stem-leaves are similar to those from the root, but the lobes have their edges cut into spine-tipped teeth, though this character is subject to some variation in different individuals. By the middle of June, the plant has reached bush-like proportions; and then sets to work to develop its massive flowerheads, a somewhat lengthy process.

These heads are of a depressed globular shape, about two and a half inches across, but the one terminating the main stem will be three inches. Immediately below each head is a ruff of long, slender bracts, needle-pointed and covered above with bristles. The heads themselves are worthy of a close and prolonged examination. They are covered thickly with white wool through which emerge the green-tipped purple points of the overlapping spines that invest the head, whose spiral arrangement is revealed by the crossing semi-circular lines described by the points. These lines converge and are lost in a central depression, from which about the middle of July is thrust out the brush of purple florets set off by a touch of blue provided by the protruding stamens.

It will be seen that, whether regarded as a whole or in its parts, the Woolly-headed Thistle is calculated to give joy to the æsthete; whilst those of grosser taste may in spring derive an unusual salad from its tender shoots.

3 *Pl.* 52. **Milk Thistle.** (p. 45). *D* 44.

Silybum marianum. COMPOSITAE.

3 *Pl.* 53. **Milk Thistle** (p. 45). *D* 45.

Silybum marianum. COMPOSITAE.

Cnicus is by some regarded as merely a section of the genus *Carduus:* for them the name should appear as *Carduus eriophorus.*

Milk Thistle (*Silybum marianum*).

Owing largely to the fact that the Milk Thistle, wherever found in these islands, is never very far from human habitations or the site of a former garden, its title to rank as a true native is very much open to doubt. It is considered to be truly indigenous around the Mediterranean, whence it was transferred long ago to the gardens of Western Europe, including our own, the root, young leaves and flower-heads being utilized as food. The plants now found are descendants of those garden crops (Plates 52, 53).

Milk Thistle is a biennial Composite herb, which in its first year forms a large rosette of huge oblong-lance-shaped leaves, cut into spiny lobes. These are dark green, curiously, intricately veined in white: a feature that renders the plant distinct from all our other Thistles. The branching stem is grooved, and attains a height between three and six feet; it is free from prickles, and its few leaves, though they clasp their support, are not continued down it as wings.

The flower-heads are globose, about two inches across, the spreading involucral bracts broad, leathery, with spiny margins and ending in a long spine-tipped point. From these emerge (June to September) a splendid tuft of rosy-purple tubular flowers, followed by a white pappus.

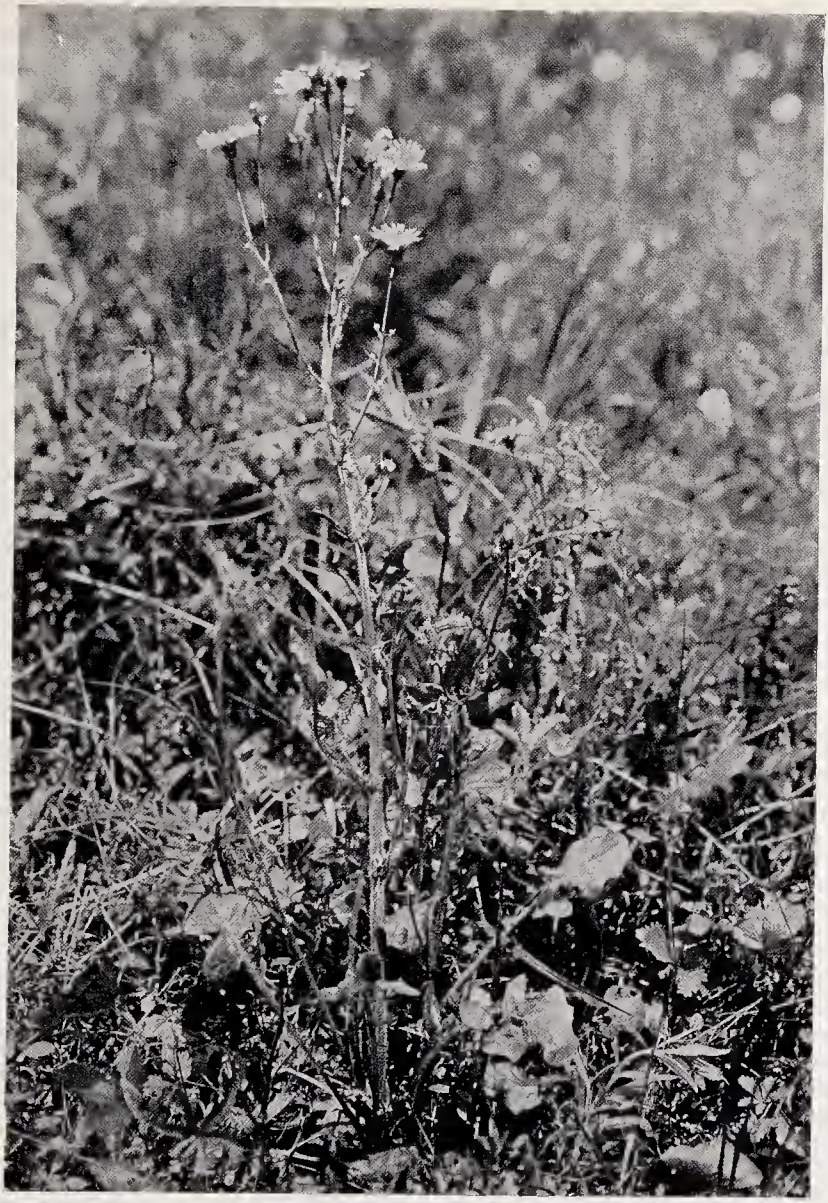
The mediæval monks, always on the look-out for propaganda material in Nature, taught that the white veins of the leaves were due to the Virgin Mary having spilled milk from her breast. The superstition is perpetuated in the scientific name *marianum*. *Silybum* is derived from a Greek name for some Thistle with spotted leaves.

Smooth Hawk's-beard (*Crepis capillaris*).

THE Hawk's-beards form one of several groups of yellow-flowered Composites with the florets all strap-shaped, that are so much alike superficially as to cause many flower-lovers to pass them by without troubling to work out their precise identities. So far as the Hawkweeds (*Hieracium*) are concerned, this attitude is scarcely a matter for surprise, for the few species enumerated by Bentham (7) and Hooker (9) are by more modern specialists expanded into a hundred or more, on minute differences that often can be appreciated only by the " splitters " themselves.

Smooth Hawk's-beard is an annual, with leaves chiefly from the root, variably lance-shaped, their margins cut into small acute lobes or large distant teeth, whose points often are turned towards the root (runcinate). The stem-leaves are stalkless, cut into long, slender lobes or large teeth, the lowest pair clasping the stem. The branched, furrowed stems vary in height from a foot to three feet. The bell-shaped flower-heads may be found continuously from June to October: they have awl-shaped outer bracts, and when expanded are half to three-quarters of an inch across. The smooth, red-brown fruits have ten or more ribs, and the pappus is white and silky. Smooth Hawk's-beard is common in all parts of the country, on waste ground, field borders, walls and even cottage roofs (Plate 45).

Small Rough Hawk's-beard (*Crepis taraxacifolia*), though very plentiful in some districts, is much more local in its distribution, showing a marked preference for chalk and limestone soils. It occurs only as far north as Yorkshire, and n Ireland. It is a bristly biennial, with the leaves cut deeply from the sides into irregular lobes whose tips point backwards. The angular, furrowed stem is a foot to



3 *Pl.* 54. **Small Rough Hawk's-beard.** (p. 46). *D* 46.
Crepis taraxacifolia. COMPOSITAE.

3 *P.* 55. **Stinking Hawk's-beard.** (p. 47). *D* 47.
Crepis foetida. COMPOSITAE.

two feet high, branching above and purple below. The stalkless stem-leaves are deeply toothed and clasp the stem. The flower-heads, found from May to July, are larger than those of the Smooth H-b., being nearly or quite an inch across ; the outer florets are striped with red or purple on the underside of the straps. The yellow-brown, slender fruits have rough ribs and taper to a long bristle-point (Plate 54).

Stinking Hawk's-beard (*Crepis fœtida*) is a rare biennial or sometimes annual, found on chalky or gravelly banks only in the extreme south-east corner of England, from the Wash southwards. Of similar stature to the Small Rough species, and like it in being bristly, it differs in the stem being only faintly furrowed and branching freely from the lower part. The leaves are mostly radical, and these are cut from the sides into wedge-shaped lobes whose tips point backwards ; the few stem-leaves are small and stalkless, more lance-shaped, toothed deeply at the base. The flower-heads have long stalks which are thickened upwards, and before expansion they droop : expanded they are bright yellow and about three-quarters of an inch across : June and July. As the names indicate, the plant at close quarters, and especially when handled, has a very unpleasant odour (Plate 55).

Large Rough Hawk's-beard (*Crepis biennis*) is another rare biennial, but with a wider distribution, its eastern range being extended into the Midlands and as far north as Yorkshire ; whilst it appears also in the neighbourhood of Dublin. It more nearly resembles the Small Rough species, but the stout stem may be as much as four feet high, channelled and ribbed, much branched ; whole plant bristly. The leaves are mostly from the root and the lower half of the stem, ranging from six inches to more than a foot in length, with the lobes irregular ; upper leaves

few, lance-shaped, clasping. Flower-heads three-quarters to one inch; outer bracts spreading: June and July. Its habitats are dry pastures and wastes on a chalky soil.

Blunt-leaved Hawk's-beard (*Crepis mollis*) is a perennial, which may be called rare, like the Stinking species, on account of its limited geographical range in this country, its southern and northern limits being Yorkshire and Banff respectively. It is a woodland plant, with a slender stem from two to three feet high, branching above. The radical leaves are smooth and spoon-shaped—broad at the tip, narrowing to the stalk; those of the stem narrow-oblong, stalkless, and half-clasping. The flower-heads (July and August) are few, an inch or somewhat less across, their stalks and bracts coated with glandular hairs.

Marsh Hawk's-beard (*Crepis paludosa*) is a perennial of mountain meadows and moist woods between the North of Scotland and South Wales; occurring also in North Ireland. The radical leaves are large and thin, the general form oval-oblong, but cut into long lobes or teeth pointing downwards, and with a slender stalk; stem-leaves stalkless, lance-shaped cut or undivided, contracted below, and clasping the stem with two "ears." The slender, furrowed stem is a foot to three feet high, sparingly branched above, with a few flower-heads covered with black, glandular hairs. When expanded—July to September—the heads measure an inch or nearly across. The ribbed, cylindric fruits have no beaks; and the pappus differs from that of all the other species in being stiff, brittle, and of a dirty brownish-white tint: in the others it is pure white and silky.

The name *Crepis* was given to these plants by Pliny, derived from the Greek word for a sandal, which the leaves were said to resemble, though it is difficult for our eyes to detect the likeness.

3 *Pl.* 56. **Shrubby Hawkweed.** (p. 49). *D* 48.
Hieracium boreale. COMPOSITAE.

3 *Pl.* 57. **Mouse-ear Hawkweed.** (p. 49). *E* 49.
Hieracium pilosella. COMPOSITAE.

Shrubby Hawkweed (*Hieracium boreale*).

In the Second Series (page 142) of this work, we gave an account of the Mouse-ear Hawkweed, a dwarf species found commonly on banks and wall-tops. But some of the Hawkweeds are large and tall, presenting an appearance quite different from that of the dwarf forms; and of the taller group the Shrubby Hawkweed is a good representative. It will be found in copses and on hedgebanks from the south of England to the east of Scotland; also in Ireland.

A perennial herb, like all the Hawkweeds, it has a tough stem from two to four feet high. The radical leaves wither early; and when the plant attracts attention by its loose cluster of bright yellow flower-heads, from August to October, it has quite a shrublike aspect. This is due largely to the large number of stem-leaves which, beginning at some distance above the ground, are rather crowded, the upper ones progressively reduced in size. These are of firm texture, dark green, the lower ones pointed oval or lance-shaped with a few distant teeth whose points are directed forwards; the small upper leaves are broader in proportion to their length, with the base rounded or almost heart-shaped. The lower part of the stem is clothed densely with long, fine, white hairs, which may be continued more sparingly to the top, or this part may be only downy.

The flower-heads, which expand in succession, measure about an inch across. Their strap-shaped florets have square ends cut deeply into five teeth; the long, two-branched styles are dark-tinted. Later, pale brownish pappus hairs crown a short, furrowed red fruit (Plate 56).

Umbellate Hawkweed (*Hieracium umbellatum*), a somewhat similar plant found in drier, more stony situations, may be distinguished by its shorter, more wiry stem, much

narrower leaves, and the cluster of flower-heads approaching more nearly to the umbel formation. The styles, too, are yellow. Although the flowering of the two species overlaps, this begins its display in July and ends usually in September.

Round-headed Rampion (*Phyteuma orbiculare*).

From the fact that it occurs in only eight per cent. of the botanical districts into which England, Wales and Scotland have been divided, few flower-lovers can have seen the Round-headed Rampion as a living plant; yet the annual migration that takes place in late summer from the North and Midlands to the South should give them full opportunity for doing so. A ramble along the chalk-downs in Kent, Sussex, Surrey or Wiltshire in July or August will almost certainly be rewarded by the discovery of the dark blue flowers closely clustered in globose heads, swaying on their long stems (Plate 58).

Round-headed Rampion is a perennial herb of the Bell-flower family (*Campanulaceæ*), with a tuberous rootstock from which arise several more or less erect stems, a foot or a foot and a half long. The radical leaves (rarely visible when the plant is in flower) have long stalks and are oval lance-shaped, sometimes with heart-shaped base; the margins with rounded teeth. The few stem-leaves are stalkless, narrow lance-shaped and progressively smaller. Each stem ends in a solitary dense head of dark-blue flowers, of which there may be forty in a single head. Although when separated, these flowers do not show much resemblance to those of the Harebell, for example, it will be found that their structure is very similar, the bell-shape being modified by the corolla being cut into five slender lobes, which are at first united by their edges, but at length separate and spread widely. Before the flower opens,

3 *Pl.* 58. **Round-headed Rampion.** (p. 50). *E* 50.
Phyteuma orbiculare. CAMPANULACEÆ.

3 *Pl.* 59. *Normal.* **Shoreweed.** (p. 62). *Abnormal.* *E* 51.

Littorella lacustris. PLANTAGINACEAE.

the anthers of the five stamens form a tube above the pistil and discharge their pollen into the space so-formed. By the lengthening of the style the pollen is swept out and the upper part of the style splits into the three short stigmas.

There is one other species, retained doubtfully on the British list on the strength of its being found wild in woods and thickets in one locality of East Sussex. Formerly, it was cultivated in this country for the sake of its edible roots ; and there is the possibility that in this one locality it established itself as a wild plant. This is the—

Spiked Rampion (*Phyteuma spicatum*), a much larger plant than the Round-headed, and so different in its general appearance that there is no possibility of the novice mistaking one for the other. The radical leaves are oval or oblong with a heart-shaped base, stalked and toothed. The ribbed stem is two or three feet high, with a few slender, stalkless leaves, and ending in an oblong head of cream-coloured flowers from May to July. As the upper flowers open, the spike elongates and becomes cylindrical, two or three inches long. The long style divides at the tip into two stigmas only.

Venus's Looking-glass (*Legousia hybrida*).

This is one of the numerous annual weeds that are to be found only in cornfields or in other land that is continuously lightened by man's industry. When they attempt to effect a footing in natural, unbroken soil they appear to be killed out by the competition of other plants : so it is believed that the cornfield weeds are aliens that were introduced with seeds from the Continent in the early days of agriculture, and have continued their existence here at the expense of the farmer.

Venus's Looking-glass is a name borrowed from a garden

plant: it appears also in books as Corn Bellflower, not because its flowers are bell-shaped, but because it was formerly known as *Campanula hybrida*. Ray speaks of it under the name of Corn Violet. It is a small herb, from a few inches to a foot in height, with wavy oblong leaves, slightly toothed: those from the roots with stalks, those from the stem without. The stem may be branched from the base or entirely unbranched, angled, and rough with minute hairs. The flower—usually solitary, at the end of the stem or branch—is singular in the length of the angular calyx tube, enclosing the ovary; its lobes are somewhat leafy, longer than those of the wheel-shaped corolla, which are lilac on the outside and blue within. The flowers may be found from June to September; they are succeeded by angular capsules an inch or more long (Plate 60).

The plant may be looked for in cornfields on dry soils, chiefly in the Eastern Counties, though its English distribution extends as far north as Durham; in Scotland it is believed to have been introduced in modern times. It has a fondness for chalky soils.

Yellow Bird's-nest (*Monotropa hypopitys*).

THE similarity of the popular names causes, at times, confusion between this plant and the Bird's-nest Orchis (see page 142); but the resemblance is very superficial, and attention to a few points serves to distinguish them. They are alike in their mode of life, and the same beech or pine wood may yield both species, though the Orchis is in flower earlier than the present plant.

Yellow Bird's-nest is a perennial saprophyte of the Heath family (Ericaceæ). Its short, fleshy roots, immersed among decaying leaves, are coated by a web of Mycorrhiza, the benevolent fungus that enables it to utilize the products

3 *Pl.* 60. **Venus' Looking-glass.** (p. 51). *E* 52.
Legousia hybrida. CAMPANULACEAE.

3 *Pl.* 61. **Annual Glasswort.** (p. 65). *E* 53.

Salicornia herbacea. CHENOPODIACEAE.

of leaf-decomposition, for the flowering plant has not the power to obtain this benefit directly from the humus. From the rootstock there arises suddenly the annual stem, thick and fleshy, clad in broad, overlapping pale yellow scales, the upper part with its spike of flowers folded down upon the lower. In July, the whole plant straightens out and the drooping, dingy yellow, fragrant flowers stand out horizontally, only the uppermost becoming erect. After fertilization, they all become erect (Plates 62, 63).

This upper flower of the spray differs from the others in having its parts in fives—five sepals, five petals, ten stamens, five lobes to the ovary, each lobe with two nectaries projecting from its base ; the lower flowers have all these parts in fours. Above the ovary there is a short, stout style expanding into a disc-shaped stigma. The petals are hollowed at the base to catch and retain the nectar dripping from the nectaries, and in order to reach this the tongue of the insect has to be pushed down between the edge of the stigma and the anthers, any pollen it brings being scraped off by the stigma and fresh pollen gathered from the anthers as the tongue is withdrawn. The flower is succeeded by a five-valved capsule, containing numerous small seeds.

An alternative name for the plant is Fir-rape, given to it in the belief that it was a parasite upon the roots of Scots Pine and Beech. This was shown to be incorrect by the investigations of Rylands, who in 1842 published an account proving that the Fir-rape was not connected with the roots of trees, but had its own roots invested by the threads of a fungus—at that time unnamed, but known now as Mycorrhiza.

It occurs locally in woods of pine and beech from Mid-Scotland southwards, and rarely in Mid-Ireland. The name of the genus is Greek, and refers to the fact that the flowers all turn one way. By some authors the genus is

separated from the Heath family and made the type of a new family—Monotropaceæ; whilst others bring the Wintergreens (*Pyrola*) away with it, including both in the family Pyrolaceæ.

Privet (*Ligustrum vulgare*).

In thickets on the chalkhills and on top of the cliffs of southern England and Ireland, the Privet is a common shrub. The visitor from suburban London, whose forecourt is hedged around with Privet, imagines that he is looking at the same plant that has escaped into the wild and established itself. But the plant that is so useful to the layer-out of small gardens and entails so much clipping work upon the small householder is another species, the *Ligustrum ovalifolium* whose home is in Japan.

Common Privet, which shares with Ash the representation of the Olive family (Oleaceæ) in this country, is a shrub from six to ten feet high, with smooth bark. Its straight, slender branches are given off in pairs (opposite), and the glossy leaves are disposed in the same fashion. These are lance-shaped, leathery, about two inches long, shortly stalked, of a dark green tint, and with clean-cut edges quite free from teeth. They are almost evergreen, for they endure through the winter, but fall in spring when the plant renews its activity.

The small white flowers are produced in abundance in June, making up for insignificant size by their arrangement in large pyramidal panicles at the summits of the stems and branches. Each flower consists of a cup-shaped calyx with four minute teeth at the mouth, a funnel-shaped corolla with a four-lobed spreading rim, two stamens, and an egg-shaped ovary with forked stigma. The flowers secrete nectar and, according to the impressions of some

3 *Pl.* 62. **Yellow Bird's-nest.** (p. 52). *E* 54.
Monotropa hypopitys. ERICACEAE.

3 *Pl.* 63. **Yellow Bird s Nest** (p. 52). *E* 55.
Monotropa hypopitys. ERICACEAE.

observers, give off a pleasant perfume; but to us their odour is not inviting (Plate 64).

To the flowers succeeds a heavy cluster of globular, green berries, each about a third of an inch in diameter, which in autumn become conspicuous from their position and the purple-black colour, which attracts many fruit-eating birds. In each berry there are two or four seeds immersed in a spongy violet pulp of bitter flavour. A rose-coloured dye is obtained from the juice, and with the addition of alum the berries yield a durable green dye for wool and silk. It is alleged that the berries are used also for improving the colour of inferior port wine (Plate 65).

The wood of the Privet—what there is of it—is white and hard; it is esteemed by the turner for various purposes where size is not requisite.

The name of the genus is from the Latin *ligo*, to bind or tie up, the pliancy of its branches making it suitable for binding faggots or looping gates. *Vulgare*, of course, denotes its profusion in suitable districts. Old folk-names for it, such as Prim and Primprint, had reference to the neatness with which it could be kept as a hedge or arbour by frequent clipping, and to its former use, like Box and Yew, in topiary work. The present form, Privet, appears to be an archaic spelling of private, given to it from an early use of the shrub to form hedges marking off portions of a garden which it was desired to make more secluded. Colour is given to this supposition by two lines from Tusser (1573):

> "Set privie or prim,
> Set box like him."

Gentianella (*Cicendia filiformis*).

GENTIANELLA is by no means a well-known plant, for it is restricted to the south and south-west parts of England

and to corresponding parts of Ireland. Even though in some of its localities it may be present in considerable numbers, its small size causes it to be overlooked until attention is called to it. It will be found in moist places along sandy seashores or in damp hollows on heaths inland. Until it is in flower—from July to October—it may be passed as the young growth of a Rush (Plates 66, 67).

It is an annual of the Gentian family, with a slender, angled stem, which may be six or eight inches in length, sparingly branched, but as it has a habit of leaning partly on the ground, it is seldom more than three or four inches high. The leaves are all in pairs and without stalks: those from the root narrow-lance-shaped, the stem-leaves awl-shaped. The branches again branch in the upper part into two or three long flower-stalks, each supporting a single small yellow flower. This has a four-lobed, bell-shaped calyx, a salver-shaped corolla with four lobes; there are four stamens, and the pistil ends in a thick, undivided stigma. The minute, egg-shaped capsule contains many seeds. The flowers remain open only in sunshine.

Henbane (*Hyoscyamus niger*).

There is considerable doubt whether the Henbane should be regarded as a true native of Britain. It is found usually on roadsides and waste places near dwellings, sporadically, and there is little certainty of finding it to-day where you found it last year. For so many centuries it has been esteemed for its medicinal properties that it was grown widely in gardens; and it is highly probable that it is the descendants of these garden plants that we encounter to-day. The succession appears to be maintained chiefly in the chalk districts.

Henbane is a herb of the Potato and Nightshade family

3 *Fl.* 64. **Privet.** (p. 54). *E* 56.

Ligustrum vulgare. OLEACEAE.

3 *Pl.* 65. **Privet Berries.** (p. 55).
Ligustrum vulgare. OLEACEAE.

3 *Pl.* 66. **Gentianella.** (p. 55).
Cicendia filiformis. GENTIANACEAE.

3 *Pl.* 67. **Gentianella.** (p. 55). *E* 57.
Cicendia filiformis. GENTIANACEAE.

(Solanaceæ) and is usually a biennial, but sometimes it flowers in its first year. It has a stout, round, branching stem from a foot to two feet long, but not always so high; bearing a scattered covering of long, soft hairs. These are developed more plentifully on the yellowish leaves, and being glandular make the whole plant sticky and invest it with an evil odour. The radical leaves are oval, stalked, and from six to eight inches long. The stem leaves are stalkless, oblong, but cut into several angular lobes; their bases clasp the stem (Plates 68, 69).

The large flowers (June to August) are so distinctive that it is not possible to confuse them with those of any other British plant. They are somewhat drooping, very shortly stalked, produced in the axils of the upper leaves. There is an oval calyx with five teeth, a funnel-shaped corolla with five broad lobes, of a dingy yellow with an almost black base, and an intricate veining of fine purple lines, five stamens, with purple anthers, and the pistil ends in a style with knobbed stigma. The ovary develops into a large capsule with a waist-like constriction, the fruit being almost hidden in the persistent calyx-tube. When the kidney-shaped seeds are ripe, the rounded top of the capsule splits off like a lid, with a clean line, to release them. In the fruiting stage, with a large number of these capsules standing all up the stem, the plant presents a singular appearance. Occasionally, the purple veining of the flower is wanting.

Respecting what has been said as to the probability that wild examples of this plant may be the descendants of escapes from the old herb-gardens: we have met with Henbane growing in some numbers on the edge of a chalk cliff in Dorset, far away from any human habitation or garden. The conditions here appeared to be all in favour of the plant being indigenous.

Henbane, it should be added, is a poisonous plant which should be handled with care. From its leaves the druggist obtains the valuable alkaloid Hyoscine, used as a sedative injection in modern medical practice.

Weasel-snout (*Antirrhinum orontium*).

On old walls, such as of castle ruins and ancient buildings connected with some of our cathedrals, the familiar Snapdragon (*Antirrhinum majus*) may often be found in great luxuriance. It has, perhaps, more the appearance of being a native when it is found about chalk-pits; but it is always the descendant of escapes from the garden, where it is so well-known as to need no description here. We have, however, a native representative of the genus —which is included in the Foxglove and Figwort family (Scrophulariaceæ). This is the—

Weasel-snout or Lesser Snapdragon, an annual herb of dry fields—chiefly cornfields on sandy or gravelly soils, in England; in Ireland it is very rare, and it is absent from Scotland. The stem is only from a foot to a foot and a half high, branching from the base. The slender lance-shaped leaves are stalkless; the lower ones in pairs, the others alternate on the branches: an inch to two inches long. The flowers may form a short spike at the end of the branch, but are mostly solitary in the axils of the leaves. They appear successively from July to October (Plates 70, 71).

There are five narrow sepals which are much longer than the rosy-purple corolla, but as they spread widely apart they do not hide it. The erect upper lip of the corolla presses upon the spreading lower lip, much after the manner of the larger species, hiding the four stamens and the two-lobed stigma, which are so disposed under the upper lip that they must be brushed by the back of a visiting bee.

3 *Pl.* 68. **Henbane** (p. 56).
Hyoscyamus niger. SOLANACEAE.

Henbane Fruits. *E* 58.
(p. 56).

3 *Pl* 69. **Henbane.** (p. 56). *E* 59.

Hyoscyamus niger. SOLANACEAE.

No other nectar-seeking insect is strong enough to obtain admittance.

The seed-vessel is a downy two-celled capsule which, when ripe, opens by three pores with teeth, through which the minute seeds sift when the branches are jerked.

The name of the genus is composed of two Greek words which are variously regarded as meaning against the nose and like a nose, in allusion to the form of the corolla.

Black Horehound (*Ballota nigra*).

THE name of this and the White Horehound has no connexion with dogs, but is said to be a corruption of the Old English *Har hune*, indicating a hoary herb. The Black element is a mere term of comparison, for there is nothing sable about the plant. *Ballota* is its ancient Greek name.

Although Black Horehound is tolerably common in England, it extends only into the south of Scotland, and both there and in Ireland it is rare and doubtfully native. It has a fondness for hedgebanks, roadsides and waste places, where it may be passed as one of the Dead-nettles. It is a perennial herb of the Mint family (Labiatæ), with a stout, much-branched stem, standing erectly to a height of two or three feet, and covered with hairs which are usually directed downwards. The wrinkled leaves are in pairs, all stalked and with toothed edges: the lower ones heart-shaped, the upper oval (Plates 72, 73).

The flowers, which may be found from June to September, are produced in numerous whorls from the axils of the leaves, consisting of small clusters each with three to six blossoms. The tubular calyx is strongly ribbed and has five spreading teeth, which are longer than the tube of the corolla. The latter, as in most members of the family, has a tubular base dividing above into two large lips, whereof

the upper is concave and erect, hairy within and without, whilst the lower has three spreading lobes. The colour is a pale reddish-purple, sometimes white. The fruits are four shining brown nutlets, which are three-sided.

Usually the plant has an unpleasant odour, but this may be replaced by a more agreeable scent. When growing along hedgerows, the grey-green of the hairy foliage suggests that the plant has gathered dust from the road, but in places remote from traffic it will be found to present much the same appearance, which is natural to it.

White Horehound (*Marrubium vulgare*) is a somewhat similar but rare plant, less tall and its hoariness is more woolly. The flowers are smaller, white: July to October. The calyx has ten short teeth. The plant is found in waste places, but is considered to be truly native only in the Isle of Wight. Its rarity may be partly due to the fact that it still enjoys considerable reputation in domestic medicine as a cough-cure. It is more aromatic than the Black Horehound (Plate 75).

Chickweed Wintergreen (*Trientalis europæa*).

THIS exceedingly pretty annual herb of the Primrose family is one of those denied to the poor southerner, unless his holiday is spent in the higher elevations of the north. It comes no farther south than Yorkshire, where it finds the necessary conditions on the mountains and moors; and is most abundant in the Highlands of Scotland, in and about the pinewoods and blaeberry bushes, ascending to nearly 3,000 feet.

It springs from a slender rootstock that creeps through the peaty soil, sending up the thin, wiry stems erectly to a height from four to eight inches. There is no branching

3 *Pl.* 70. **Weasel-snout.** (p. 58). *E* 60.

Antirrhinum orontium. SCROPHULARIACEAE.

3 *Pl.* 71. **Weasel-snout.** (p. 58). *E* 61.

Antirrhinum orontium. SCROPHULARIACEAE

and, short of the top, there are only two or three minute leaves. At the summit there is a whorl of five or six oblong-oval leaves, each leaf differing in size from its fellows. They are stiff and glossy, narrowed into a short stalk, and varying in length from one and a half to two and a half inches (Plate 76).

The flowers—from one to four, but usually two—appear in June or July, springing on long thread-like stalks from the centre of the leaf-cluster. The flower-parts vary from five to nine, but mostly they are seven. The calyx consists of seven very long and slender sepals, and the corolla of seven white or pink petals, connected at their bases by a fleshy yellow ring encircling the ovary and supporting the seven stamens. The pistil consists of a globose ovary, a thread-like style with a thickened stigma, which is ripe before the anthers discharge their pollen—a condition that favours cross-fertilization. The fruit is a round capsule splitting into five valves that roll back.

Brookweed (*Samolus valerandi*).

The Brookweed has a fairly wide distribution in our islands, extending from the south of England almost to the north of Scotland, but it cannot be classed among our commonest plants ; and its small size may cause it to be overlooked. It is a perennial herb of the Primrose family (Primulaceæ), and its usual habitats are marshy and watery places on a gravelly or sandy soil, especially near the sea. It occurs also where there are trickles of water on clay cliffs ; and we have found it springing from the bedding joints of the Portland rocks on the Purbeck coast.

Its perennial duration requires a little explanation, for the short rootstock as well as this year's stems die completely in the autumn. During summer, however,

shoots are produced at the base of the stem and, rooting, establish themselves independently for next season's flowering (Plates 78, 79).

The radical leaves, which form a rosette, are oval, almost glossy, yellowish-green, without teeth or other division; the stem-leaves few and alternately placed. The smooth, round stems—of which there may be as many as four or five—vary from three or four inches to nearly a foot in height, and terminate in gradually lengthening sprays of small white flowers, from June to September.

The flower consists of a hemispherical calyx with five triangular lobes; a salver-shaped corolla with five short, blunt lobes; five stamens with short filaments attached to the corolla-tube, and a roundish ovary attached partially to the calyx. In addition, there are five stamens without anthers (staminodes), standing up between the lobes of the corolla and constituting what Babington describes as "a crown" to the corolla. The fruit is a globular capsule filled with rough seeds.

An alternative name is Water Pimpernel.

Shoreweed (*Littorella lacustris*).

THROUGHOUT the British Islands, wherever there are lakes, ponds or canals on gravelly or sandy soil, the Shoreweed may be expected to reward the diligent seeker; and yet it must be reckoned among the less-known of our wild plants. It grows close to the margin, in quite shallow water, often in crowded turf-like patches, when its small size and rush-like appearance may deceive the casual observer, especially as it does not flower under water, but waits until a dry season has reduced the water-level or one of its runners has produced a colony on land.

Shoreweed is a perennial herb of the Plantain family

3 *Pl.* 72. **Black Horehound.** (p. 59). *E* 62.
Ballota nígra. LABIATAE.

3 *Pl.* 73. **Black Horehound.** (p. 59). *E* 63.
Ballota nigra. LABIATAE.

(Plantaginaceæ), with a white, more or less erect rootstock, from which emerges a large number of long, white, rarely branched roots. The few leaves (five or six), which all spring directly from the rootstock, are cylindrical and end in a sharp point. They vary in length from an inch to five inches, according to the depth of water: the large ones are only 3 mm. broad; the whitish bases sheath one another. From their axils emerge firm green threads, four or five inches long, from whose tips new plants are produced. When growing upon land, the leaves become flat and channelled, and may form a rosette (Plate 59).

The white flowers (borne only when the plant is growing upon land) are not of the showy kind, or calculated to attract attention to the plant. They are of two kinds—male and female—both borne on the same plant; but the females have to be searched for. The flowers are on a leafless stalk which arises from the leaf-sheaths; and should be sought in July or August.

The flower-stalk is much shorter than the leaves, rough, and with one or two small bracts below the middle; at its summit it supports a single male flower, consisting of four sepals with thin margins, a tubular corolla with four lobes at its mouth, four exceedingly long stamens with large pale anthers, and a rudimentary ovary. At the base of the scape and hidden among the leaf-bases are two female flowers. These have three or four unequal sepals, a pitcher-shaped corolla with three or four teeth at the mouth, and the flask-shaped ovary has a style three or four times the length of the flower. As both stamens and style suggest by their great length and their protrusion from the flower, the carriage of pollen is effected by the wind. After fertilization, the female flower develops into a sort of nut —a bony capsule containing a single seed.

The foregoing is a description of the normal form of the

plant, but we have met with an example, growing out of the water on a Dorset heath, which showed a considerable departure from the type. A photograph of this abnormal plant is reproduced on Plate 59. The leaves—about four inches long—were very suggestive of those of the Buck's-horn Plantain, a not very distant relation, though a member of a distinct genus. They were nearly flat, very narrow, pointed at the end, channelled on the upper surface, and some of them had distant side teeth as shown. But the most striking departure from the normal was that both male and female flowers were on separate long stalks, and the long style of the female was feather-like.

The name of the genus is from the Latin *littus*, the shore, and the species name indicates its partiality for lakes and pools.

Seablite (*Suæda maritima*).

WHERE there are salt-marshes, muddy or sandy shores on most parts of our coasts, there will be little difficulty in finding the Annual Seablite, a member of the Goosefoot family (Chenopodiaceæ). It is rather untidy in its growth, for whilst some of the leafy stems are erect to a height of a couple of feet, others, as also the long branches, are half-erect or trailing on the ground. The long, fleshy leaves are half-cylindrical, with an acute tip and tapering at the base; though arranged alternately they are crowded on the branches. The flowers, which appear from July to October, are inconspicuous, being small, green and partially hidden by the leaves. They may be solitary, but are usually in threes or fives. They consist of a five-parted calyx, no corolla, five stamens and a pistil. The fruit is bladder-like, enclosing a single shining, brownish-black, beaked seed (Plate 83).

3 *Pl.* 74. **Spreading Orache.** (p. 67). *E* 64.
Atriplex patula. CHENOPODIACEAE.

3 *Pl.* 75. **White Horehound.** (p. 60). *F* 65.
Marrubium vulgare. LABIATAE.

We have one other species, the—

Shrubby Seablite (*Suæda fruticosa*), but it is both local and rare, its distribution being restricted to that part of the East Coast lying between the Wash and the Thames, and then reappearing on several parts of the coast of Dorset, notably on the east side of the Chesil Bank near Portland. We may wonder to see its large bushes and extensive thickets on ground so unpromising; but out of sight the spaces between the pebbles are filled with the organic debris that sifts through the upper layers, and here the roots are able to ramify in rich soil. Shrubby Seablite has thick woody stems two or three feet high, and numerous branches more or less erect, with a dense covering of slender, fleshy leaves, which have rounded tips and are dotted with white. The flowers, which are similar to those of the annual species and found at the same season, are produced either singly or in clusters of two or three, and the pistil has three styles. The seed is shining black (Plate 82).

Glasswort (*Salicornia herbacea*).

Glasswort or Marsh Samphire is a seaside plant that attracts not by its insignificant flowers—which have to be looked for—nor by its leaves, for it has none. The general appearance of the plant as we meet with it on the mud-flats that are covered at high-water is that of a small, slender cactus, with cylindrical stems consisting of many close joints of a succulent character, bright green in summer but turning to red later. We have two species, an annual and a perennial. They are members of the Beet and Goosefoot family (Chenopodiaceæ).

Annual Glasswort (*Salicornia herbacea*) is found commonly on all our coasts where there are salt-marshes or mud-flats.

The stem, which is woody at the base, is made up otherwise of a succession of juicy internodes, each about half an inch long, the total length being from six inches to a foot and a half. There are side branches of similar formation emitted in pairs, and these either spread or ascend. At the upper ends of stem and branch the internodes are much shorter, and these constitute the flower-spikes : the minute, simple flowers being produced in pits on each side of the nodes. These may be found from July to September. Each flower consists of a top-shaped perianth with three or four lobes and the mouth contracted : there are one or two stamens and two styles. The popular name is said to have been given because the plant was largely burnt formerly in order that its ashes (barilla) could be used in the manufacture of glass ; but it seems obvious that it came from the glass-like appearance of the living plant (Plate 61).

Creeping Glasswort (*Salicornia perennis*) has a perennial woody rootstock which creeps underground, sending up rounded stems that lie along the ground, rooting and producing tufts of erect succulent branches, some barren, others flowering. The plant is browner in colour than the annual species. It flowers from August to October, and affects similar situations, but is confined to the English coasts and gets no farther north than Yorkshire. The flowering spikes are stouter, with blunt tips.

Annual Glasswort has been split up by the specialists into seven species, based on obscure differences which would scarcely appeal to the average flower-lover if they were set out.

The name *Salicornia* is a Latin combination, indicating the plant's fondness for the salt-marsh and the supposed horn-like appearance of the branches.

3 *Pl.* 76. **Chickweed Wintergreen.** (p. 60). *F* 66.
Trientalis europaea. PRIMULACEAE.

3 *Pl.* 77. **Sea Purslane.** (p. 68). *F* 67.

Obione portulacoides. CHENOPODIACEAE.

Orache (*Atriplex patula*).

Spreading Orache, to give it the full name, is one of the many plants that are a nuisance to the kitchen-gardener, for though they come up freely on waste ground everywhere, they have a marked preference for soils that have been worked and manured. It is an annual herb of the Beet family (Chenopodiaceæ), covered with mealy hairs which give it a frosted appearance (Plate 74).

The slender, more or less erect stem varies from a few inches to three feet, and is striped with reddish resinous lines. The numerous branches spread widely in all directions, the lowest trailing so that one plant covers a large patch of ground. The leaves are lance-shaped with a wedge-shaped base, some with a few irregular teeth. The minute green flowers are in clusters on spikes at the ends of the shoots and from the axils: they may be found from June to October. They are of two kinds—male and female—on the same plant. As usual in this family, there are no petals; the males consist of three to five sepals and a corresponding number of stamens, with the ovary rudimentary. The females have only two sepals, which are united below; there are no stamens, but the ovary is developed and has two thread-like styles. The fruit is a bladder-like nut, enclosed in the enlarged calyx and containing a single seed. There are several varying forms, and some authors give these the rank of species: one having the lower leaves triangular-halberd-shaped being known as *Atriplex hastata*.

Frosted Orache (*Atriplex arenaria*) is an annual of sandy seashores, marked by its entire silvery whiteness, and the scarcely striped buff-coloured stem, which branches from the base and spreads along the ground. The leaves have a wedge-shaped base, but vary from rhombic to halberd-

shaped, irregularly lobed or toothed. The male flowers are in dense spikes, the females in the axils with a few males among them : July to October. In all the species the wind is the pollinating agent.

Atriplex is the old Latin name for this group of plants ; *Obione* is by some authors included in the same genus.

Sea Purslane (*Obione portulacoides*).

Along the sandy and muddy seashores we meet with a number of plants that, as a rule, do not attract much attention from the average visitor. The reason is that, apart from such subjects as Sea Kale, Sea Holly and Sea Convolvulus, their flowers are small and inconspicuous. Seablite is noticeable on account of its bushy growth, but Sea Purslane demands attention because of its striking whiteness, due to a mealy coating over stem and leaves alike.

It is a shrubby perennial with a branched, woody rootstock, and the lower part of the stem is woody also. This may be as much as three feet long, but as it leans upon the ground the height of the plant is supplied by the erect branches, which are a foot or a foot and a half high. The thick leaves, which are mostly in pairs and erect, whether the branch be vertical or horizontal, are oval or spoon-shaped with blunt or rounded tips and tapering to a long narrow base. The branch ends in a two-inch spray bearing close clusters of minute yellow flowers, which may be found from July to October. With the aid of a good glass it will be found that there are two kinds of flowers—male and female—and sometimes these are on separate plants. The males consist of a three- to five-parted calyx or perianth with five stamens and no pistil ; the females have a two- to four-parted perianth, with two stigmas but no stamens. It is important to remember that when these have reached

3 *Pl.* 78. **Brookweed.** (p. 61). *F* 68.

Samolus valerandi. PRIMULACEAE.

3 *Pl.* 79. **Brookweed.** (p. 61). *F* 69.
Samolus valerandi. PRIMULACEAE.

the fruiting stage they remain without stalks. The plant is common on most of the English and Irish coasts, but is rare in Scotland (Plate 77).

Stalked Sea Purslane (*Obione pedunculata*), the only other British species, is an annual, found only in muddy salt-marshes on the east coast of England from Lincolnshire southwards. It is in most respects similar to the perennial species, but shorter and smaller. It has a slender herbaceous stem, sparingly branched, from three to eight inches high. The leaves are only half the dimensions of the other, and more slender in proportion. The flowers are in small clusters in the axils of the leaves : the female perianth larger, stalked, bell-shaped, with two lobes and two intervening teeth ; August to October.

The white mealiness of both plants is due to a dense covering of minute greyish-white scales.

Docks (*Rumex*).

Among the most striking of our wayside weeds, owing to their size and abundance, must be numbered the members of the genus *Rumex*, of which there are from eleven to fifteen British species according to the lists of different authorities. Of these, however, two have been long separated by the public under the name of Sorrels ; but this has not altered their botanical status ! Several other species are quite rare, and of the commoner sorts it is not a simple matter to make the differences interestingly clear to the novice. The task is made more difficult from the readiness with which hybrids are produced, and the consequent confusion of the parental characters. Then, too, the flowers though produced in abundance by each plant are very small, and being pollinated by the wind are green : so that little help can be obtained from them at first. But it is essential

that we should at once seek to know their structure. The plants are either perennial or biennial.

The floral envelope is known as a perianth, and consists of six green leaves, which will be referred to as sepals. These are in two series, three outer and three inner, the latter becoming much enlarged after the flower has been pollinated. Within these are six stamens arranged in three pairs, and a three-sided ovary with three thread-like styles, ending in brush-like stigmas. In most of the species, one or more of the inner sepals bears a tubercle, whose character is useful for identification purposes. In the fruiting stage, these inner sepals, enlarged, become leathery and embrace the three-sided fruit.

Curled Dock (*Rumex crispus*) is a bold perennial, met with on every roadside and in waste places everywhere, with large lance-shaped leaves from six inches to a foot long, whose sides are waved and crisped, and the base abrupt or tapered to the stalk. The leafy, branching stem is a foot to three feet high, bearing from June to October numerous erect sprays of green flowers, sometimes tinged with bright red, the upper fruiting sepal with a smooth oval tubercle (Plate 80).

Broad-leaved Dock (*Rumex obtusifolius*), also a perennial, is found in similar situations, and is commonly troublesome in pastures. The leaves are equal in length to those of the Curled Dock, but much wider : those from the root oval-oblong with blunt tip and a heart-shaped base, the midrib spotted thickly with dark red ; the stem-leaves oblong-lance-shaped. The stout stem is two or three feet high. It flowers from July to September. The sepals are long-triangular with raised veins, and long spreading teeth from the edges , the upper sepal (and sometimes others) has a large oval tubercle of a crimson colour, which tint spreads more or less over the sepal.

3 *P.* 80. **Curled Dock.** (p. 70). *F* 70.
Rumex crispus. POLYGONACEAE.

3 *Pl.* 81. **Great Water Dock.** (p. 71). *F* 71.
Rumex hydrolapathum. POLYGONACEAE.

Sharp Dock (*Rumex conglomeratus*) is a widely distributed perennial, but less common than the foregoing, with a preference for wet meadows and moist wastes, flowering from June to October. The leaves are similar in shape and size to those of the Curled Dock, but the base is rounded or heart-shaped. The long flower-spikes are more leafy and the whorls of flowers more distant. The fruiting sepals are narrow-oblong, without teeth, and all of them with a large oblong tubercle.

Blood-veined Dock (*Rumex sanguineus*) is a wide-spread perennial of which there are two superficially different forms: one which supplies the distinctive name has the veins coloured red and the remainder of the leaf more or less suffused with dark red; in the other the whole leaf is uniformly green. The red-veined form is rare and is found in woody or bushy places; the other, which is sometimes called *R. viridis*, is found much more frequently along hedgerows and roadsides. When in flower or fruiting, it may attain a height of four feet, the slender stem with few or no branches. The leaves are oval- or oblong-lance-shaped, slightly wavy, the root-leaves with a rounded or heart-shaped base. The flower-spikes are usually leafless except at the base; the fruiting sepals oblong, the upper one with a large, smooth tubercle. It flowers in July and August (Plates 84, 85).

Great Water Dock (*Rumex hydrolapathum*) is our largest and finest species, a distinct ornament to the riversides and watercourses that it makes its home, its branched and leafy flowering stems rising to a height of six feet. The broad lance-shaped leaves are from a foot to two feet long, usually tapering at each end, but sometimes with a heart-shaped base. The fruiting sepals are somewhat triangular, and all of them have an oblong tubercle. The flowering time is July and August (Plate 81).

Common Sorrel (*Rumex acetosa*).

Our two smallest species of *Rumex* have been separated from the Docks in popular nomenclature under the name of Sorrels to indicate the sourness of their foliage. Their leafing does not suggest any close affinity with the Docks, though their flowering might raise a suspicion, turned to a certainty upon a close examination (Plates 86, 87).

Common Sorrel, which is much the larger of the two species, is abundant in most meadows, pastures and woods throughout the country, flowering from May to August. It has a slender, tufted rootstock with a rosette of long-stalked, arrow-shaped leaves, which are glaucous on the underside and somewhat fleshy. The slender stem rises to a height of a foot to two feet, with stalkless leaves whose bases clasp their support. The stipules are brown. From the axils of the upper leaves long, slim flowering branches are produced, with the small flowers in whorls as in the larger Docks. In these flowers the sexes are separated, male flowers appearing on one plant and female flowers on another ; the male whorls are more densely flowered, and the flowers less strongly tinged with red than in the females.

Sheep's Sorrel (*Rumex acetosella*) is a much smaller plant that prefers the drier pastures and the sour soil of the heath, rendering its tufts conspicuous in the latter half of the year by its foliage developing a bright red tint. It has a branched, creeping rootstock, and the numerous radical leaves form a thick rosette, lying close to the ground. Instead of the arrow-shape of the Common Sorrel, these are more spear-shaped, the basal lobes being turned outwards. The several stems may be only a few inches or more than a foot high, their leaves stalkless and the stipules silvery. The flowers may be found from May to August ; the males and smaller females on separate plants.

Both species are perennials.

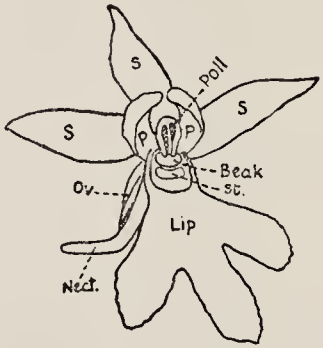
WHAT ARE ORCHIDS?

THE flowers of our comparatively few British Orchids ever have considerable attraction for the Nature-lovers who come upon them in their rambles; though often they are the occasion of considerable puzzlement to those who like to understand what they find, but may have some difficulty in explaining these flowers in relation to the more prevalent types of structure. The common distinction between sepals and petals is not obvious at a glance; the pistil with its style and stigma cannot be traced, and the stamens are sought in vain. The structure of the flower as compared, say, with a Primrose or a Buttercup—well-known types—is so unlike either that it has to be studied as something new. When, however, we have come to this conclusion, and set about acquiring some familiarity with the Orchid plan of structure, we shall find that the minor modifications of it presented by the various genera and species will give us little trouble. Before we proceed to an examination of the flowers, it would be well to say a few words concerning the plants that bear them.

The Orchids form a very distinct family (Orchidaceæ) of perennial herbs, of which something like 7,000 species are known; these are distributed over the greater part of the earth, but are represented most abundantly in tropical regions. In the humid forests of warm countries, they have largely abandoned the ground, and taken to a life in the air, clinging to the trunks of trees: these are distinguished as Epiphytal Orchids. With these, at present,

we have no concern, for in our northern zone all the Orchids are Geophytes, or plants of the earth. These have, as a rule, fleshy or tuberous roots, into which all their vital reserves are withdrawn before winter. The leaves are mostly long, strap-shaped, undivided, and with parallel nerves; their bases are wrapped around the stem. Where there are several leaves they are attached alternately to opposite sides of the stem, which is always unbranched.

The flower has three sepals and three petals, but as the sepals usually are coloured and more or less like the petals, it is customary to speak of the six floral leaves collectively as the perianth. The central one of the three petals is, in most cases, larger than, and of different form from, the other two, and known as the lip (labellum). In the descriptions of species that follow, the lip will be referred to always as distinct from the petals, purely as a matter of convenience. Structurally, the lip is the upper petal, but it appears usually as the lowest of the floral leaves. The ovary, which after fertilization becomes developed into the seed-vessel, is always below the perianth, and its frequent length may cause it, at first sight, to appear to be the flower-stalk. By a half-twist of this organ (or sometimes of the footstalk below it), the flower is reversed usually, this accounting for the common position of the lip. In many species, the base of the lip is extended backwards to form a long or short hollow spur in which there may be free nectar. The relative positions of the flower-parts are indicated in the diagram.



Flower Parts in Orchis

SSS, sepals; PP, petals; Poll., pollinia; St., stigma; Nect., nectary or spur; Ov., Ovary

It is when we come to a consideration of the sexual organs that the chief puzzlement of the Orchid-flower arises. We look in vain for the usual central pistil surrounded by a ring of stamens; instead, we find a remarkable extension of the axis of the flower above the ovary, and this is known as the column. It is formed by a union of the style with the stamens, with the result that only one of the three stamens is developed. This will be found facing the lip, the two lobes of the anther standing side by side, each containing a mass of pollen-grains (pollinium) attached to a slender stalk, which may end below in a sticky gland. The only one of our native Orchids that departs from this arrangement is the Lady's Slipper, in which two stamens are developed. Below the glands of the pollinia, extends the stigma, which is usually viscid in order that it may lay hold of pollen pushed against it by insect carriers. In the eighteen genera into which the British species have been divided, there will be found modifications in detail of the general plan; and to these attention will be directed when the respective groups are reached.

The Orchids are a very dependent family: with few exceptions they rely upon insects to aid in the fertilization of their seed-eggs by carrying the pollinia from one flower to another; and when the ripe seeds have been dispersed, they cannot be brought to the stage of germinating without the good offices of a fungus—some species of *Rhizoctonia*. If a ripe capsule of any species be opened—it splits lengthwise into three valves—it appears to be filled with dust, but if this is examined through the pocket-lens, it will be seen to consist of very small, spindle-shaped or cylindrical seeds, of which the greater part of each is empty, only the centre containing a solid portion. This is the embryo; but there is no store of albumen, as is usual in seeds, to serve for the growth of the infant plant on germination.

This is not a full statement of the imperfection of the seed, for, if we dissect the embryo under the microscope, we shall find that it is a mere mass of cellular matter without differentiation into radicle, stem-bud and seed-leaf, such as are found in most other seeds. It is little more advanced than the spore of a fern or moss.

This type of structure renders the seeds extremely buoyant and capable of wide dispersion by air-currents; but unless they chance to alight upon soil where the right species of *Rhizoctonia* is already in possession, they will merely perish. This extraordinary fact was not known until in recent years; for lack of the knowledge, the trade-growers of exotic Orchids failed in most of their efforts to propagate the plants by seed-sowing, and had to send collectors abroad to keep up the supply of mature plants. In the rare instances where they contrived to raise seedlings, it was due more to accident than to knowledge—from seeds shed naturally about the roots of living Orchids, or sown upon a compost that included some root-fibres of dead plants. In either case, the fungus was present; and its activity stimulated the seeds into fertility, though the grower never suspected the agent that was bringing his efforts to fruition.

The presence of a fungus in the roots of some Orchids was made known about eighty years ago, and in 1886 Wahrlich showed that this symbiosis was probably universal throughout the family; but its significance was not realized until the results of Bernard's researches were published in the early part of the present century. An interesting summary of these and related investigations was contributed to *Scientia* by J. Costantin, of which a translation will be found in the Report of the Smithsonian Institution for 1913; a fuller and more recent story was contributed by J. Ramsbottom, F.L.S., to the Transactions of the British

3 *Pl.* 82. **Shrubby Seablite.** (p. 65). *F* 76.
Suaeda fruticosa. CHENOPODIACEAE.

3 *Pl.* 83. **Annual Seablite.** (p. 64). *F* 77.
Suaeda maritima. CHENOPODIACEAE.

Mycological Society for 1922. With this knowledge, the commercial grower of Orchids can now raise his thousands of seedlings from a single plant with almost as much ease as the suburban gardener grows his Sweet Peas or Mignonette. For this revolution in methods, the nurseryman was not indebted to his own practical skill and experience, but to the disinterested researches of the scientific botanist. As M. Costantin somewhat maliciously remarks: "One would never suspect that a venerable science like botany, apparently adapted only for the delight of collectors who have a pleasant fancy for glueing dry plants on paper, could be capable of affording such assistance to an industry so important as that of Orchid-growing. It could not be anticipated that the biology of these plants was so extraordinary."

If we take up an Orchid-root with very great care, and lightly shake off the attached earth-particles, we shall find that the fleshy root-fibres are without the root-hairs by whose agency most plants absorb food from the soil. These are present only in very young seedlings of the Orchids; and through them the fungus threads enter the tissues of the plant. But a closer examination with the aid of a lens will show that the fleshy fibres of older plants are invested by a delicate web of fungus filaments which also penetrate the tissues of the roots: it is this mantle that has enabled the Orchid to dispense with the root-hairs. Here, for example, is a photograph of the large palmate tuber of the Spotted Orchis (*Orchis maculata*), with numerous thick root-fibres penetrating the soil in various directions, and all coated with the fungus-threads. These are more obvious in the original photograph than is possible in any reproduction from it (Plate 99).

The Spotted Orchis lives in sour, peaty soil which is rich in organic nitrogen; but no green-plant can break down

the old tissues that contain it. The root-fungus, however, can extract and so prepare it that it is in a form suitable for the Orchid's food, after elaboration in the green leaves. As the fungus has the ends of its threads actually in the tissues of the Orchid, a transfer of supplies from one organism to the other is a simple matter. This is the phenomenon known to naturalists as symbiosis. What the fungus member of the partnership gets as his share of the profits, is not yet clear; but there can be little doubt that he receives as well as gives. It is probable that some of the carbohydrates manufactured in the green-leaf laboratory, pass to the fungus, where they are as acceptable as are the nitrates to the green-plant. It is believed that the Orchid obtains the nitrogenous material from the fungus by digesting the latter's mycelium in specialized cells. In the Bird's-nest Orchis and the Leafless Orchis, the dependence upon the Mycorrhiza has been carried so far that the plants have no leaves or other green parts for the elaboration of the material supplied to the roots.

Respecting what has been said upon the dependence of Orchid-seeds on fungi for their germinating quality, it is advisable, perhaps, to state that Prof. L. Knudson, of Cornell University, U.S.A., has sought to cast doubt upon the belief. Following Edward Clement in this country, Knudson has succeeded in raising seedlings of several exotic Orchids by laboratory methods: by sowing the seeds in tubes on culture solutions containing fruit-sugar, but no fungi. He admits that the apparent effect of the natural invasion of the Orchid-seed by the fungus is to change starch into sugar; but contends that this transformation may be external to the seed with equal value for growth. The success of these efforts in the laboratory emboldens Knudson to exclaim: "The evidence for the necessity of the fungus for germination has not yet been conclusively proved." It

3 *Pl.* 84. **Blood-veined Dock.** (p. 71). *F* 78.
Rumex sanguineus. POLYGONACEAE.

3 *Pl.* 85. **Blood-veined Dock.** (p. 71). *F* 79.
Rumex sanguineus. POLYGONACEAE.

did not occur to him, perhaps, that there may be a great discrepancy between what is possible in laboratory experiments and what is practicable in Nature; for it appears as if he were telling Nature that she is old-fashioned in her methods and taking quite unnecessary trouble to achieve her purpose. The evidence is overwhelming, that the Orchids have, for some reason and by some means, taught themselves to rely so entirely upon fungus-aid in the stimulation of their seeds to germination that, if a Knudson-law could be enacted prohibiting such methods, the present generation of wild Orchids would have no successors, and only those produced commercially by what may be termed the chemical process would exist in future.

Ramsbottom, in *The Orchid Review* (1922), replying at length to Knudson, concludes with the following "incontrovertible facts":

"The roots of all Orchids growing naturally have fungus mycelium in their cortical cells. . . . The fungus present in Orchid roots is always the same genus, i.e., *Rhizoctonia* of Bernard, *Orcheomyces* of Burgeff. The only known case where a different genus is concerned is the Japanese species, *Gastrodia elata*, where the toadstool *Armillaria mellea* forms an association with the tuber. . . . Orchid seedlings, both native and cultivated, show the fungus present in their cells from the earliest stages of development. It seems probable that originally the fungus was a true parasite on the Orchid, but a study of the present course of events shows that the flowering plant normally has the fungus well under control and might now, with a certain amount of truth, be regarded as parasitic on the fungus. . . . To a mycologist an Orchid seedling without its fungus is like Hamlet without the Prince of Denmark."

Dr. E. J. McLennan, as the result of her investigation of the relations between a Mycorrhiza and the grass Darnel,

is of the opinion that the substances obtained by the Orchis from the fungus are carbonaceous and not nitrogenous. She says: "It is conceivable that the tuberous habit, which is so extraordinarily widespread in plants with endophytic Mycorrhizas, may have been brought about by the large amount of such material which can be obtained by the plant through the intermediation of the associated fungus." It appears, also, that the fungus is unable to attack tissues that contain chlorophyll; in some of Bernard's experiments, he found that portions of the green stem served to poison the fungus on the roots of the same Orchids.

As the Orchids appear to have become dependent upon fungi for essential elements of their food supply, so also the greater number of them would be unable to produce their imperfect seeds but for the aid of insects in carrying the fertilizing pollen from flower to flower, and stimulating the production of seeds from the ovules or seed-eggs in the ovary. In most cases, the pollinia remain in the anther-pouches until removed, involuntarily, by insect visitors, to be transferred by them to the stigmas of other flowers of the same species. In only a few of our native Orchids does the flower secrete free nectar: as a rule, the insect seeking it has to pierce the tissues of the spur or the column in order to obtain it. Whilst engaged in this task, its head is pressed against the viscid discs (mostly present) at the base of the pollinia-stalks, and the short interval of the visit is sufficiently long to allow of their firm cementing to the insect: so that, when the latter backs out of the flower, the pollinia are dragged out of their pouches and carried away. Immediately, they begin to bend forward on their stalks until they are more or less horizontal, in which position when the carrier enters another flower, the pollinia will be pushed against the sticky surface of the

3 *Pl.* 86. **Common Sorrel.** (p. 72). *F* 80.
Rumex acetosa. POLYGONACEAE.

3 *Pl.* 87. **Common Sorrel.** (p. 72). *G* 81.

Rumex acetosa. POLYGONACEAE.

stigma, where at least some of it will be retained. It then acts after the manner usual with pollen on stigmas: each grain sends out a shoot, which penetrates the tissues, reaches the ovary and brings about the production of seeds. Among our native Orchids are a few more archaic species, with the pollen less completely fashioned into stalked pollinia: to these attention will be directed in the proper place.

The comparative rarity of the British Orchids is, to a large extent, due to natural causes—their soil preferences and the climatic conditions which determine their distribution in different parts of the country, as well, probably, as the presence or absence of the requisite Mycorrhiza. In some cases the natural distribution has been modified by human activity, such as the destruction of forests, the reclaiming of fen and bogland by drainage, the extension of towns, etc. At one time, the continued existence of species with large tubers must have been threatened by wholesale digging for the conversion of the tubers into Salep; though, apparently, the major portion of this material was imported. Then there was a craze for transferring the plants to gardens, where they had little chance for survival in the unsuitable soil. In our own time, the war against Orchids has been intensified, paradoxically, by those who proclaim themselves lovers of the beautiful and curious. Possession and present gratification count with these persons more than the conservation of the species admired. The members of Botanical Exchange Clubs, too, when they come across a good thing, take a liberal helping to improve their powers of barter for species they have not found—a distinctly commercial consideration, though not so regarded. "Nature study" classes, and prizes for wild-flower collections at local flower-shows, add to the waste and decimation.

Some of these evil agencies have been operating, of course,

for generations, as shown by the following remarks of the editor of the second edition of Sowerby's *English Botany* (1840), with special reference to the case of the Lizard Orchis :

"Sir J. E. Smith lamented the cupidity of collectors of the past generation, but how much more evil is enacted by those of the present ; some of whom, not content with gathering specimens for the herbarium, root up by thousands the gems and beauties of our national flora, not for the purposes of science, but of sordid gain. By such, professedly botanists, it is to be feared that the most common even of the Orchis family will soon be rendered as rare in the vicinity of the metropolis, where they once abounded, as has long since been the *O. hircina*."

The rich Orchid-producing country to the south of the metropolis, to which the quotation refers, is to-day nearer and more easily accessible to a huge population than it was even in the present writer's youth ; and the destructive agencies are more numerous. It is really a marvel that some of the Orchids still contrive to persist, though in sadly diminished numbers. But it is good to know that several sections of the North Downs have in recent years been rescued from the builder and placed for public enjoyment in the care of the National Trust. These places have been famous in the past as natural Orchid nurseries ; and it is to be hoped that visitors will assist in their continuance as such by refraining from grubbing up the plants or too liberally gathering the flower-spikes. Plants, like animals, die from old age ; and unless in their vigour they are allowed to produce seeds the race cannot be continued.

May we beg earnestly every reader of this book, by his own self-restraint, to assist in keeping our small Wild Orchid Flora still in being ?

3 *Pl.* 88. **Green-winged Orchis.** (p. 83). *G* 82.
Orchis morio. ORCHIDACEAE.

3 *Pl.* 89. **Green-winged Orchis.** (p. 83). *G* 83.
Orchis morio. ORCHIDACEAE.

BRITISH ORCHIDS

Green-winged Orchis (*Orchis morio*).

THE typical genus *Orchis* has thirteen British species. Below the fibrous roots there are, in the growing season, two tubers, from which the genus derives its Greek name. In the different species these vary somewhat in shape, and may be round, oval, or somewhat flattened with the lower side produced into several lobes. One of these tubers is dwindling, its reserves, accumulated last summer, being used up in the building of this season's plant and the support of the flowering stem and seed-capsules; whilst the other is accumulating reserves for next year's use. The leaves, which are oblong or lance-shaped, are chiefly from the root, and their lower part clasps the stem. The upper part of the stem is a dense or lax spike of flowers, whose general structure has been described; in this genus the lip is continued behind as a hollow spur, but it contains no free nectar. The anther is attached to the column in its entire length, its cells diverging below, and the sticky glands of the pollinia-stalks rest in two lobes of a pouch with the beak projecting between them. These are the characters common to the various members of the genus Orchis.

The Green-winged Orchis is found in May and June, in the meadows and rich pastures of England and Ireland; it is more abundant in the south than in the north, and in some southern districts it occurs in great numbers. Its

tubers are round or nearly so, the newly formed one will be found at the end of a root half an inch away from the other. The narrow lance-shaped leaves are more numerous than in most species ; they are without spots, and the upper ones ensheath the stem in their full length. The stem varies from six inches to a foot in height ; and the flowers are disposed loosely. Individually rather large, they are not numerous, there being only from twelve to twenty in a spike. They are dark purple in colour, the tint varying towards both blue-purple and crimson-purple. The sepals and petals are marked in their length by strong parallel stripes of green, and they converge to form an arching hood. The green lines afford a ready means of identification at sight, for no other species has this kind of ornamentation. The broad lip has three lobes, the side ones sloping downwards ; the margins of the lip are toothed, and in the centre there is a pale patch dotted with purple. The stout, blunt spur, curved slightly upwards, is about equal in length to the twisted ovary (Plates 88, 89).

Occasionally, we may come across examples with the flowers white, crimson or violet.

Early Purple Orchis (*Orchis mascula*).

THIS plant, believed to be the " long purples " and " dead-men's fingers " of Shakespeare—" that liberal shepherds give a grosser name "—is certainly the commonest as well as the earliest of our native Orchids, for it is found in meadows, pastures and woodlands throughout the British Isles, beginning to flower in April and continuing into June. At a distance, its appearance is much like that of the Green-winged Orchis, but a closer inspection of the leaves and flowers at once removes any doubt upon the point (Plates 90, 91).

3 *Pl.* 90. **Early Purple Orchis.** (p. 84). *G* 84.
Orchis mascula. ORCHIDACEAE.

3 *Pl.* 91. **Early Purple Orchis.** (p 84). *G* 85

Orchis mascula. ORCHIDACEAE.

Here, the tubers are egg-shaped, and both are close to the base of the stem. The leaves are narrow-oblong or elliptical with a blunt point: they are more or less marked with purple-black, which may be in broad blotches or reduced to small spots; occasionally they are plain.

The stem, usually, is taller than that of *morio*, but varies from six inches to a foot and a half, ending in a lax spike of six to thirty flowers. These are red-purple, and the hood is not so well-fashioned as in *morio*, the outer sepals being turned upwards. The lip is as broad as its length, with small spots of darker purple, and divided into three lobes, of which the middle lobe has a notched tip and the side-lobes are sloped down. The stout, blunt spur is longer than the ovary, and may turn down, up or be horizontal. Occasionally, the flowers have been found without any spur. They vary in the intensity of their colour, some being almost white; and a similar irregularity is found in their odour, which from different plants may be variously described as scarcely perceptible, pleasantly fragrant or disgusting.

From the newly matured tubers of this species and of *Orchis morio* was prepared the breakfast drink known as Salep, in the days before coffee was popularized. Other species were used also, but this was the principal source of the delicacy, the supplies being chiefly imported from Turkey, at fancy prices.

Dark-Winged or Lady Orchis (*Orchis purpurea*).

A FINE, conspicuous plant, now apparently restricted to a few localities in Kent, where it occurs in copses and bushy places about the chalkhills. Attaining a height of a foot to three feet, its long, dense spikes attract the attentions of its human neighbours, who allow it little opportunity for producing seed by which its range might be extended:

for its flowers are gathered for decorative purposes as soon as they appear in May (Plates 92, 93).

The tubers are oval, and the large leaves oval-oblong, the lowest ones lying on the ground and giving the sprouting plant the appearance of a lily in the corresponding stage. The closely packed spike may be four inches in length, with the minute bracts hidden among the flowers.

The flowers are large, the front aspect measuring three-quarters of an inch, including the hood and the tips of the lip. The hood, though pale inside, is a dark purple-brown with darker lines on the exterior, offering a strong contrast with the pale, broad lip, which is tinted delicately with pink or lilac and dotted with crimson. The dots are raised, consisting really of hairs. The lip is four-lobed, for the broad middle portion has a deep notch at its toothed end, and in this notch is a little point. The side-lobes, from the base of the lip, are long and narrow. The spur, which is only half the length of the ovary, curves sharply downwards.

Looking at the fully open flower from the front, it is easy to understand why, in the places where it grows, it is known as Lady Orchis. Miss Pratt, who wrote in the early "eighteen-sixties," when the prevailing fashion made the resemblance more striking, admits "that there exists some slight similarity in each blossom to a lady attired in wide-spread gown and close bonnet." There is, of course, no resemblance to the short-skirted, straight-sided maidens of to-day. Miss Pratt says also that in Kent and Sussex, in her time, the flowers were "often very conspicuous in the woodlands and on the bushy hill," and that they were carried into the towns in baskets for sale. This constant cutting of the stems, with the consequent impoverishment of the tubers, is sufficient explanation of its rarity to-day.

Mr. J. R. Matthews records specimens from Kent whose

3 *Pl.* 92. **Dark-winged Orchis.** (p. 85). *G* 86.
Orchis purpurea. ORCHIDACEAE

3 *Pl.* 93. **Dark-winged Orchis.** (p. 85). *G* 87.
Orchis purpurea ORCHIDACEAE.

flowers bore six pollinia—that is to say, that the two staminodes, which are aborted stamens, were here fully developed.

In some books this species bears the name of *Orchis fusca ;* but Hudson's name—*O. purpurea*—has precedence, and is in general use.

Military Orchis (*Orchis militaris*).

So like is this to the Lady Orchis that there has been considerable doubt as to the propriety of regarding one as more than a sub-species of the other ; and the following species, the Monkey, is in similar case. All are so rare that the average field-botanist has little opportunity for comparing them critically. They are certainly related very closely ; but at present it appears advisable to accept the decision of various authorities who have separated them.

The Military Orchis was found formerly on the chalk-hills of four of the English counties in or adjacent to the Thames Valley, but little has been seen of it in recent years, and it may have been exterminated by over-collecting—a fate that threatens all our rarer Orchids. This is more likely to happen with species like the Lady and the Military, which are imperfectly fertilized in this country, for few seeds are produced by those that happen to escape the attentions of the collector. In this connection, we may recall Darwin's experience : he examined ten flower-spikes of the Lady when most of the flowers had withered naturally, at which stage the seed-capsules should be formed or in course of development. The ten spikes bore a total of 358 flowers, and of these only eleven had formed capsules. Five of the spikes had not produced a single capsule between them. *Orchis militaris* shows its close affinity with *O. purpurea*, perhaps, by sharing its sterility ; though

this appears to be less pronounced on the Continent, for, in Germany, Sprengel found five spikes bearing 138 flowers which had set thirty-one capsules.

The Military Orchis stands a foot to two feet high, with two oval tubers at its base, and large, oblong, concave leaves. The flower-spike and the flowers are similar to those of the Lady, but smaller in all their parts. The flowers are bright or pale purple, the lip paler ; the lip has four lobes, of which the lateral ones are more slender, the middle lobes with their tips curved upwards ; the red dots are raised and rough. The short, blunt spur curves downwards. It should be sought between mid-May and mid-June.

Monkey Orchis (*Orchis simia*).

LIKE the two previous species, of which some authorities consider it to be at most a sub-species, the Monkey is very rare and restricted to a few localities in Berkshire, Oxfordshire and Kent : that is to say, it has been recorded from these places in the past, but, at present, those who seek it in the two former counties are almost certain to be disappointed : in Kent it has been found more recently. Let us hope that, like certain others to be described, it will make a reappearance.

The Monkey Orchis follows the general lines of form that have been mentioned for the Lady and the Military Orchids, but is smaller and more slender in all its parts. The chief distinction lies in the lip, which is pale purple, but the four curved lobes are all very slender, long, and of a deeper tint. It is the uniform length and narrowness of these that have suggested a likeness to a monkey with long, slender limbs, but the tail, represented by the tooth between the terminal lobes, is very small. The flowers are pale purple, varying

in the intensity of tint: the middle of the lip and the interior of the hood dotted with raised, crimson points. The spur is about half the length of the ovary. Like those of its near relations, the flower should be looked for in May and June (Plate 95).

A feature that tends to connect this species with the Military Orchis is the presence of coumarin in the leaves of both, as becomes evident from the odour of new-mown hay when they are being dried for the herbarium. (See also Green-man Orchis.)

Dwarf Orchis (*Orchis ustulata*).

THIS very small, but pretty species is found on chalk-hills and in dry pastures in England only: and it is accounted one of the rarer kinds. It is possible, however, that it may not be as rare as it appears to be: for its habit of growing among coarse grasses and its small size serve to hide it, even where it is present in considerable numbers. It is referred to sometimes as the Burnt Orchis, from an idea that the colouring of the hood gives the flower-spike the appearance of having been scorched—a fancy embodied also in the botanical name *ustulata*. In Sussex, we have heard it called "Dibs," but we cannot explain the significance of the name (Plates 94, 97).

There are two narrow-oval tubers, which are only two-thirds of an inch long. The stem and spike are usually four or five inches high, but they have been recorded up to ten inches at times. The leaves, about two and a half inches long, are narrow-oblong, bluish-green and unspotted; the lower shorter with blunt tips, the upper ones more pointed and clasping the stem entirely. The flower-spike is oval, short and dense-flowered, with thin, violet-tinged, whitish bracts.

Considering the flowers individually, we find that the sepals and petals are dark crimson-purple, and form a close hood. The white lip is only about 6 mm. long, and has two broad side lobes, whilst the middle portion is divided into two short lobes ; there is a double central line of raised purple dots, and a few of these—variable in number and position—on the side lobes. The spike includes from thirty to fifty blossoms, appearing in May and June ; and they give off a pleasant odour suggestive of Heliotrope. The blunt spur, only a third of the length of the ovary, curves outwards. There is a variety in which the hood as well as the lip is white.

The seed-capsules, when fully formed but still unripe, are stout oblongs of a whitish-green tint, with three strong, rounded ribs marking the sutures ; later, they become brown and split along these lines. The two lowest leaves of next year's spike make an appearance above ground in October, and are active throughout the winter, though they do not reach the size of the upper leaves, produced in spring.

In addition to the more obvious details of structure described above, there are several points, noted by Darwin, to which attention should be directed. In the centre of the lip, there is a deep channel which leads up to the entrance to the spur, in this case quite small and triangular in form. The upper angle of this opening is overhung by the beak, which has a rather pointed pouch containing the discs of the pollinia. The stigma is divided, one half on each side of the beak ; but the two parts are connected by a sort of bridge of stigmatic tissue, in the form of a narrow rim just below the beak. The pollinia, when they have become attached to an insect's head, diverge slightly as they droop : so that when inserted in another flower they will strike each one of the stigma lobes.

It will be seen that a useful purpose served by the double

3 *Pl.* 94. **Dwarf or Burnt Orchis.** (p. 89). *G* 90.

Orchis ustulata. ORCHIDACEAE.

3 *Pl.* 95. **Monkey Orchis** (p. 88). *G* 91.
Orchis simia. ORCHIDACEAE.

line of purple dots is to emphasize the position of the channel between them, and so to keep the insect's head in proper alignment for detaching the pollinia; and when visiting a second flower, carrying these, to ensure that they shall be pushed against both parts of the stigma, there to leave some of the pollen.

Spotted Orchis (*Orchis maculata*).

By these names we have been content, from the days of Linnæus until quite recently, to know an early summer Orchis that occurs commonly in damp soils in all parts of the country: a plant with spotted leaves and a dense spike of pale purple or lilac flowers, prettily spotted or streaked with deeper purple. After much controversy respecting the relative status of several forms of the plant, it now appears to be accepted generally that under the one name Linnæus included two species, to which, of course, distinctive names have had to be allotted. For one the name of *O. fuchsii* has been adopted by some authorities; but it seems better to retain the familiar Linnean designation of *Orchis maculata*. The other we may distinguish as the Heath Spotted Orchis (*Orchis elodes*). In both these orchids the tubers are of what is known as the palmate type: that is, instead of being round or oval as in those described previously, they are more or less flattened and the lower part divides into thick, finger-like lobes, giving a rude resemblance to a hand. In some of the books of the last century, Orchids with palmate tubers were distinguished as Hand-Orchids. To the botanist, such plants are known as Dactyl-Orchids

The Spotted Orchis (*O. maculata*) has a tuber about an inch and a half wide, with three to five "fingers," which may be of considerable length, running downwards. Other

fleshy roots spread out horizontally from above the tubers. These will be found all webbed with the delicate hyphæ of the root-fungus that is the orchid's messmate. The straight, slender stem varies in height from six inches to two feet. The leaves are keeled and usually spotted, the lowest leaf oval to elliptical, shorter and blunter than the others; the upper leaves very narrow and sharply pointed. As a rule, all the leaves are spotted or blotched with dark purple; but we may find examples whose leaves are quite free from spotting. On the underside they are silvery-grey. The bracts are green as a rule, and the lowest bract is longer than the flowers (Plates 96, 98, 99).

The flowers begin to open in June—occasionally in May—the spike being then pyramidal and short; but it lengthens with the expansion of the higher buds and becomes quite cylindrical, in which condition spikes may be found as late as August. Both sepals and petals are pale purple, the petals with the upper sepal forming an erect hood, the side sepals spreading. The broad lip is marked with dots and curved lines of deeper purple, and is cut into three lobes, of which the mid-lobe is the longest and is separated from the side-lobes by a deep cleft on each side. The comparative sizes of the lobes of the lip furnish an important character in distinguishing this from the next species. The usually straight spur is nearly as long as the ovary, and tapers from the mouth to the tip. The lines and dots on the lip vary greatly in strength: they may be only slightly deeper than the ground colour, or a purple so dark as to be almost black by contrast, or of any intermediate strength.

The flowers appear to be fertilized by such bees and flies as have long tongues or proboscides powerful enough to pierce the lining membrane of the spur, and so to obtain the nectar that lies beneath it. Darwin records that he and

3 *Pl.* 96. **Spotted Orchis.** (p. 91). *G* 92.

Orchis maculata. ORCHIDACEAE.

3 *Pl.* 97. **Dwarf Orchis.** (p. 89). *G* 93.
Orchis ustulata. ORCHIDACEAE.

his son George both observed Empis-flies (that ordinarily employ their powerful beaks for impaling other insects, whose juices are drained) inserting these organs into the spur, and saw them emerge with the pollinia attached to their eyes. One fly had as many as six pollinia sticking to it, showing that it had visited at least three flowers in succession. In June, 1925, Mr. J. Collins captured the fly, *Physocephala rufipes*, also with six pollinia attached to the lower part of its face. It was reported at a meeting of the Entomological Society of London (June 2nd, 1926), when the fly was exhibited, that the pollinia were considered by Dr. Rendle, of the British Museum, as being probably those of *Orchis maculata*. A French naturalist captured a longicorn beetle with a cluster of the pollinia of this Orchis fixed to the front of its mouth. Often, the plant is too plentiful to allow the insects of a district to do justice to its flowers: many of the plants in a crowded colony having their pollinia intact and developing no seed-capsules.

In addition to reproduction by means of seeds, there is in our experience a vegetative increase, the cylindrical roots developing buds and tubers, as shown in the photograph (Plate 99), where the mycelium of its fungus-messmate is visible also.

Spotted Orchis may be found in damp places about woods, copses and pastures, on stiff soils and on chalk downs.

Heath Spotted Orchis (*Orchis elodes*).

As indicated already, there is a strong general resemblance between this and the last species, so close that even the school of botanists known as "splitters" refrained from breaking up the old *Orchis maculata* into two or more species. The resemblance is in the flowers chiefly, though

even here there are marked differences when the two are considered closely and compared. It is found more in soils which have peat as a constituent, and some acidity; on heaths, and among Sphagnum in bogs. Further, it may be found in flower as early as late April or the beginning of May (Plate 101).

Its tubers are of the same palmate form as those of *maculata;* but the stem is not so straight, neither is it so tall, its usual height being from four to eight inches only. The lower leaves are not so broad: all are lance-shaped, keeled and folded lengthwise, arching from the stem, with their lower part clasping it. They are spotted or blotched, as in the last species—the spots sometimes taking the form of rings. The short bracts are mostly purplish, but are not conspicuous.

The dense flower-spike starts as a broad pyramid, lengthening as the later buds expand, but not becoming cylindrical. The flowers are pale purple, varying to bright purple and pure white, with darker fine streaks which have a tendency to break up into dots. The sepals are narrower than those of the last species, and either spread or droop, The lip is broad, and appears broader because the side-lobes do not turn down; the middle lobe is very small and much shorter than the others. The spur is more slender, and of equal width throughout its length.

The two species appear to hybridize pretty freely when both occur in the same neighbourhood, and to give rise to intermediate forms which have hindered the separation of the parent forms in the past.

Marsh Orchids.

THE Marsh Orchids present a close parallel to the case of the nearly related Spotted Orchids. Until recently they

3 *Pl.* 98 **Spotted Orchis.** (p. 91). *G* 94.

Orchis maculata. ORCHIDACEAE.

3 *Pl.* 99. Roots and tubers of Spotted Orchis. (p. 91). *G* 95
Orchis maculata. ORCHIDACEAE.

were regarded as one species under the Linnean name of *Orchis latifolia;* to-day several species are recognized, and there are those who hold that the form chiefly considered as *O. latifolia* is not a true species, but a hybrid between *O. prætermissa* and *O. maculata.* According to Col. Godfery, all the Marsh Orchids hybridize freely with the Spotted Orchis: wherever they grow together intermediate forms (hybrids) may be looked for. The investigations into, and the discussions upon the group, are not yet finished; and it is probable that the segregation adopted below will be varied as the result of further enquiries. All grow in marshes, bogs or wet meadows, and are in flower from mid-June to August: those accepted generally as true separate species have the leaves unspotted; the leaves of *O. latifolia* have ring-spots.

In the light of these preliminary remarks, the reader, probably, will regard the Marsh Orchids of his rambles with a critical eye. They may be distinguished from the Spotted Orchids by their more or less hollow stems.

Broad-Leaved Marsh Orchis (*Orchis latifolia*).

ALTHOUGH found chiefly in damp and marshy places throughout the country, this Orchis does not appear to be insistent upon absolutely wet conditions. It has been said that it occurs only where *O. maculata* and *O. prætermissa* are growing in the neighbourhood. This is held to support the contention that it is a hybrid (Plate 103).

The tubers are palmate; and the stem is usually hollow, ranging from six inches to two feet in height. The grey-green or blue-green leaves are lance-shaped, broader in the middle and with flat, blunt tips; the lowest leaves more oblong. As a rule, they are spotted or have rings of a chocolate tint, but these may be absent.

The dense flower-spike may be cylindrical or conical, the flowers opening in May or June. The flowers vary in colour from pale lilac with darker markings to dark purple : the upper sepal and petals converging to form a hood, and the side sepals spreading. The lip is broader than long, and three-lobed, the margins slightly incurved ; it varies almost to white, the centre with a symmetrical pattern of darker lines and spots. The distinct, but variable middle lobe has a blunt tip. The awl-shaped spur is shorter than the ovary ; its throat broader than that of the Spotted Orchis.

Dwarf Marsh Orchis (*Orchis purpurella*).

Recently discovered as a distinct species, this smallest of the Marsh Orchids has been recorded from marshes and damp meadows in a few localities of Wales, northern England and Scotland. It has long, tapering tubers ; and the stem is usually from four to six inches high, actually hollow but almost solid—which may point to its being a hybrid between the solid-stemmed Spotted Orchis and one of the hollow-stemmed Marsh Orchids. The pointed, lance-shaped leaves are broader at the base, with a keel, and usually only in the upper part small purple-brown spots which may be solid or rings. The flowers are purple, of a red or duller tint ; and the bracts are purplish-brown. The rhomboid lip is marked with crimson streaks ; and the spur is stout.

It flowers in June and July.

Common Marsh Orchis (*Orchis præternissa*).

Most of the plants regarded formerly as being *Orchis latifolia* were of this species, so that, when the differences between the two were pointed out, Druce's name for the

3 *Pl.* 100. **Early Marsh Orchis.** (p. 97). *G* 96.
Orchis incarnata. ORCHIDACEAE.

3 *H.* 101. **Heath Spotted Orchis.** (p. 93). *H* 97.
Orchis elodes. ORCHIDACEAE.

segregate (*prætermissa*—omitted) seemed very appropriate. It grows in marshy and boggy places, often actually in water ; and may be found in flower from June to August.

It has palmate tubers. The hollow stem varies in height from six to eighteen inches, and is pretty well covered by the more or less upright leaves. These are slender-lance-shaped, narrowing upwards from a broad base to the sharp, concave tip ; ranging in colour from yellow-green to very dark green, but entirely free from spots. The flower-spike though fairly dense is not crowded : at first conical, then cylindrical. The purple-brown bracts are longer than the flowers ; the latter are crimson-purple or reddish. The paler hood consists of the upper sepal and two petals, the side sepals spreading. The lip is as long as broad, with three lobes (the central lobe small), spotted and lined with purple ; the sides not turned down. The curved spur is of equal breadth throughout (Plate 109).

The Common Marsh Orchis is distributed widely in England and Ireland ; in Scotland and the North it is represented chiefly by its varietal form *pulchella,* which has shorter, broader and paler leaves, and darker flowers with the smaller lip broader than long. *Prætermissa* is known to hybridize with the Spotted Orchids and the Early Marsh Orchis.

Early Marsh Orchis (*Orchis incarnata*).

LONG regarded as at most a sub-species of *Orchis latifolia,* this plant is now given specific rank as the result of recent research. It grows under similar conditions, and may be passed over as one of the other Marsh Orchids ; though the absence of spots from the large yellow-green leaves may awaken doubt. It is more local than the other species, and may be looked for in similar situations to *prætermissa,*

where it may be found in flower from May to the early part of July (Plate 100).

Like the other Marsh Orchids, it has hand-shaped (palmate) tubers and its height varies from six to twenty inches. The stem is stout and hollow, with sharp ridges, which are continuations from the nerves and margins of the leaves and bracts. The leaves are very long, of an elongated lance-shape and, as indicated already, of a clean yellowish-green entirely free from spots or other markings, and they take an upward direction. The bracts are in shape similar to the leaves, green, but the upper side more or less tinged with purple, due to the upper cuticle being so coloured.

The dense cylindrical or elliptical flower-spike is about five inches long, and the flowers vary in tint from flesh, lilac-pink to pale purple (rarely white), and are about forty in number.

In structure, the flowers have the two outer sepals arched and spreading, whilst the upper sepal and the two upper petals converge to form a hood for the sexual organs. The lip is variably three-lobed, the side lobes slanted downwards, and the centre spotted and streaked with a darker tint. The ovary is about half an inch long, and the twist is chiefly at the base, so that its lines and ridges appear to be straight. The spur is conical, one-third of an inch, with a blunt tip curved forward in front of the ovary. This is one important point in distinguishing *incarnata* from *prætermissa*, where the spur is not conical but cylindrical and curved backwards. The pollinia are dark grey-green, with yellow stalks. The stigma is outlined in dark purple.

A rare form with rich purple flowers is distinguished as the var. *pulchella*.

3 *P.* 102 **Pyramidal Orchis.** (p. 99). *H* 98

Orchis pyramidalis. ORCHIDACEAE.

3 *Pl.* 103. **Broad-leaved Marsh Orchis** (p. 95). *H* 99.
Orchis latifolia. ORCHIDACEAE.

Pyramidal Orchis (*Orchis pyramidalis*).

ONE of the prettiest and most attractive of our Orchids, the Pyramidal, is found chiefly on chalk and limestone in England, and more rarely in Scotland and Ireland. On some of the southern chalk-hills it occurs in great abundance, colouring the steep slopes with its rosy spikes from June to August. The tubers are roundish, and the slender, erect stem measures from six inches to two feet, according to its immediate surroundings. The unspotted leaves are narrow-lance-shaped, tapering to a sharp point; the lower partially, and the upper entirely, clasping the stem. When the lowest crimson-purple flowers open, the spike is distinctly pyramidal in outline; but when the upper blooms expand, it becomes more oblong. The colour effect is heightened by the purple tint of the long bract below each flower. A peculiar odour is given off, which appears to vary or to strike different noses as pleasant or unpleasant —Darwin described it as " foxy " (Plate 102).

Although the general plan of the flower is similar to that of the species described already, there are some notable differences in working out the details, apparently for the purpose of fitting it more fully to the visits of another group of insects—butterflies and moths.

The petals and the upper sepal form a pointed hood for the protection of the pollinia, and the side sepals spread outwards. The lip is broader than it is long, cut into three oblong lobes, well apart; at its base is a plate with two high ridges and a central furrow. The ridges turn outward, making a broad opening to the valley, which becomes very narrow at the mouth of the slender spur—which is longer than the ovary. This narrow channel on the lip forces the proboscis of butterfly or moth to push against the projecting beak of the flower.

In this Orchid, the beak is placed so low down that the stigmatic surfaces are above it on each side ; and it projects so far forwards as almost to close the spur. It forms a pouch in which is a single saddle-shaped disc, highly viscid, to which both pollinia are attached. The slightest pressure depresses the beak and sets free the saddle, which adheres to the insect's proboscis, the ends curling around it tightly and causing the drooping pollinia to diverge at an angle which, on their presentation to another flower, will secure the pollination of both stigmas.

Darwin was impressed strongly by the perfection of this mechanism ; and in *The Fertilization of Orchids* deals with the details of structure minutely and at considerable length. He states his conviction that " in no other plant, or indeed in hardly any animal, can adaptations of one part to another, and of the whole to other organisms widely remote in the scale of nature, be named more perfect than those presented by this Orchis."

That is how this little flower struck one of the greatest minds of the nineteenth century. If the wonder of these blossoms was known to the ruthless despoilers who gather the spikes in hundreds or thousands merely to make a patch of colour for a few hours in their homes, would they continue to do their worst to make the Orchids an extinct race in Britain ? Probably so ; for these people react only to beauty in the mass and cannot appreciate it in small doses. A man may grow poetical over miles of moorland empurpled by millions of sociable heath-plants, without being able to see beauty in the cunning arrangements of a single Heath-bell.

Even the commoner Orchids are less numerous in individuals to-day than they were in the days of our youth. This, no doubt, is due to the greater facilities now for reaching their favoured haunts : formerly reached by a healthy

3 *Pl.* 104. **Lizard Orchis.** (p. 102). *H* 100.

Orchis hircina. ORCHIDACEAE.

3 *Pl.* 105. **Tuber of Lizard Orchis.** (p. 103). *H* 101
Orchis hircina. ORCHIDACEAE.

walk of several miles from a railway station, but now the motor-vehicle can be taken right on the ground, and parties in place of individuals engage in gathering the attractive flower spikes for home decoration. In spring, the woods are thus despoiled of their primroses and cleared of daffodils and bluebells ; later, the tall spires of foxglove share their fate ; the downs are sheared of their Orchids, and the moorlands of their heath and heather.

But a good deal of vandalism is indulged in by those who go on their feet and have only their hands for carrying the spoil. The hands sometimes get tired, and the flowers are dropped as, after all, tiresome things. Recently, on the Dorset downs, we observed a couple of ladies busily gathering the rosy-purple spikes of this Pyramidal Orchis, of which already they had as many as could be grasped comfortably ; they worked as though they were to be paid for the results of their labour. An hour or so later, we returned by the same track, and found the flowers lying in two discarded heaps, not far from the site of their growth. Hundreds of plants had been foiled in their efforts to leave posterity ; and the spoilers could have been gratified only to the extent of temporary possession. Even the people who are more reasonable in these raids, and may believe themselves to be real lovers of flowers, require to be taught that an exhibit of three or four spikes of Bee Orchis in a small vase is a much more beautiful thing than a crowded bunch of the same flowers in which individual grace is lost.

Some County and District Councils have adopted by-laws having for their object the ending of this vandalism ; but their orders are not enforced easily in the remote places where they are needed most ; it is to the growth of more enlightened ideasin the individual that we must look for an improvement in this matter.

Lizard Orchis (*Orchis hircina*).

APART from the remarkable form of its flowers, this is one of the most interesting of the British Orchids. From its first appearance in botanical literature, it was a rare plant, restricted to a few localities in Kent and Surrey ; it became scarcer, and finally disappeared. For more than half a century it was regarded as extinct in this country. Although common in western France, it appears to be nowhere else abundant, occurring only sporadically, and frequently as a single plant. Kent, no doubt, was its English home ; and its somewhat doubtful Surrey station was Box Hill, near Dorking, as given by the authors of *English Botany* (1814).

Ray records that the Lizard Orchis or Great Goat-stones was first noticed as a British plant by a Dr. Bowles, who found it between Dartford and Crayford. In the *Botanist's Guide* (1805) it is again recorded from the same neighbourhood. Bentham (1858) says " has been found in Kent and Surrey, but not in recent years." It seems, however, to have kept foothold in Kent, for in 1860 Mr. Oxenden, the then owner of Broome Park, Barham, near Canterbury, speaks of it as though it were a regular inhabitant of his estate ; and it was from him that Darwin received fresh specimens for use when he was writing *The Fertilization of Orchids*, in which he refers to the species as " this extremely rare British plant " (Plates 104, 105).

Nothing more appears to have been heard of the Lizard until near the end of the century, when Lord Avebury says he saw a single specimen (1899) in Ollantigh Park, near Wye : a careful search failed to find others. During the present century, it reappeared, and has occurred in many districts with comparative frequency : first, in the Wye district of Kent, repeating the performance at inter-

3 *Pl.* 106. **Fragrant Orchis.** (p. 106). *H* 102.
Gymnadenia conopea. ORCHIDACEAE.

3 *Pl.* 107. **Fragrant Orchis.** (p. 106). *H* 103.
Gymnadenia conopea. ORCHIDACEÆ.

vals; later in several parts of Sussex, East Kent, North Hampshire, the Wiltshire downs (where it was found in 1907 and not again until 1927), and even as far West as Somerset; and quite recently on the North Downs in Surrey. Unfortunately, collectors are so keen upon securing specimens that there is little prospect of the plants producing seed; otherwise, the Lizard might become one of the less rare of our Orchids.

There are two large, egg-shaped tubers, flattened at the top, from which, quite early in the year, two large oblong-lance-shaped leaves are produced before the stem appears. The stem bears about five other leaves, of similar shape, though narrower, their lower parts wrapped closely around it: all without spots. The stem appears to vary in height between a foot and three feet—some say five feet—ending in the long spike consisting of many flowers; the one photographed had about twenty-eight, which must be a low number, as records have been made of fifty and up to eighty on one spike.

Concerning the individual flowers: the three sepals are in contact to form a greenish-grey hood, and in the upper sepal are concealed the two narrow lateral petals; the inner surfaces of both sepals and petals are covered with delicate lines and stippling of minute brown dots. The most striking feature of the flower is the strap-shaped lip, two inches long and three mm. wide, except at the base, where it broadens to five mm. with crisped margins ending in two contorted, long and slender, lateral lobes. The main strap or central lobe of the lip has a divided tip. The greater part of its length is coloured a dull greenish-buff, at first with a tinge of mauve, becoming more greenish later. The basal half-inch is white, marked with two or three longitudinal bars of upright, bright violet hairs, which may coalesce into a broad blotch. There are dots of violet

also around the contracted mouth of the short, blunt spur. The mouth is almost closed by white hairs. The beak, too, is violet, the anther covered with minute brown dots. The pollinia are two mm. high, connected at the base; and the short, rounded pollen-masses are green.

The very strong, objectionable odour given off by the flowers has been described always as goat-like, and led to the plant being named *hircina*. We submitted it to several friends whose sense of smell was keen, and it was described variously as resembling a herd of goats at a short distance; as strongly reminiscent of cockroaches; and like decaying vegetable refuse. As to the insects that are attracted by this odour to bring about fertilization, scarcely any information is available. Mr. H. G. Champion observed a small species of burrowing bee (*Halictus quadrinotatus*) visiting the flowers in France, but it had stuck to the discs and was not strong enough to free itself. He found that the little black ant (*Tapinoma erraticum*) had been caught in the same manner.

The great length of the lip as compared with those of all our other Orchids is somewhat of a puzzle, in the absence of precise information as to the fertilizing agent or agents; but it may be presumed that it offers a particularly convenient alighting stage for the insect chiefly concerned. In the opening bud, it may be seen coiled closely, after the manner of a watch-spring. When expanded, it has twisted cork-screw-fashion, with about four coils. In many of the illustrations of the flower-spike that have been published, the lips are shown more or less horizontal, some with an upward inclination: some of our own photographs show the same tendency. This is due to the pictures having been taken before most of the lips have become fully extended, when they show a remarkable uniformity in standing out from the stem at a downward angle of about 50°.

The very short spur is evidence that the flowers are not patronized by moths or other long-tongued insects : rather should we expect to find that the work of carrying the pollinia was effected by an insect with biting jaws. We are led to this supposition by the presence of the violet bars at the base of the lip and the hairs around the mouth. Many years ago, Darwin advanced as a pure speculation, unsupported by evidence, that the function of such excrescences on the lips might be to induce gnawing insects to feed upon them, and so bring their heads in contact with the viscid discs of the pollinia. Promptly, Crüger and Müller, in the West Indies and Brazil, declared that several tropical species of Orchids had their lips gnawed in this way. We see that the position of the violet stripes in relation to the beak, is such that a small bee, such as *Halictus*, employed in gnawing them, would, at the end of the row, be likely to push against the beak, especially if she finished up by sampling the mouth-fringe.

The plant that we kept under daily observation until every flower had withered, appeared to have had no insect visitors : no pollinia had been removed, and not a single ovary developed into a seed-capsule. This may have been due to the temporary removal of the plant from its chalk-hill home to a district which did not produce the necessary insect ; or it may support the view that the Lizard Orchis is so rare in this country owing to the fertilizing insect being restricted to the Continent, and that our English examples spring from seeds brought across the Channel by birds or gales. In this connexion, it may be noted that our friend, Mr. T. A. Dymes, F.L.S., who has paid attention to the microscopical characters of Orchid seeds, informs us that though the Lizard is the largest British member of the genus *Orchis*, its seeds are smaller than those of any of its fellows.

The removed plant referred to above, at the end of its flowering stage had quite exhausted the tuber from which it had arisen; but the other—shown in a photograph—was full and plump, with the white bud from which the next season's stem would develop. It was replanted carefully in the locality whence it had been borrowed.

Fragrant Orchis (*Gymnadenia conopea*).

We have met with people in the field who were unable to distinguish with ease this plant from the Pyramidal Orchis. There is, certainly, a close colour resemblance, and the long, slender spurs common to both help the confusion; but the flower-spike of the Pyramidal never gets so cylindrical as that of the Fragrant; neither is there any similarity in their odours.

The Fragrant Orchis is a generally distributed species in this country, found on banks and hilly pastures, chiefly on chalk or limestone; and in flower in June and July. It is usually about a foot in height, but varies from six to eighteen inches. The oval tubers are lobed below; and the leaves are narrow-lance-shaped, keeled at the back and folded lengthwise. The long, narrow, purplish and slightly grooved flower-spike may have the blossoms crowded or fairly separated: a condition dependent largely upon the age of the spike, its lengthening allowing more space for each flower. The bracts are longer than the ovary, and are edged with purple (Plates 106, 107).

The flowers are of some tint of rosy-purple, and strongly sweet-scented. The upper sepal and two petals form a hood whose sides extend down to the lip, and the long lateral sepals spread widely. The lip has three almost equal rounded lobes, and is continued backwards as a very long, slender, curved spur, about 16 mm. long, which is

3 *Pl.* 108. **Green-Man Orchis** (p. 108). *H* 106

Aceras anthropophora. ORCHIDACEAE.

3 *Pl.* 109. **Common Marsh Orchis.** (p. 96). *H* 107

Orchis praetermissa. ORCHIDACEAE.

more than twice the length of the ovary. Unlike the spurs of the species described thus far, it contains an abundant supply of free nectar, which, in combination with the alluring fragrance, makes the flowers very attractive to butterflies and moths, by which the green, oblong pollinia are removed almost as soon as the flower is open.

The arrangements of the pollinia and stigmas show a departure from what we have seen hitherto. The viscid discs at the base of the pollinia-stalks are narrow oblongs, as long as the stalks, lying together and forming a sort of roof to the spur. The stigmas are horn-shaped processes at the sides of the spur opening, but slightly higher. To understand exactly what happens when a butterfly or moth inserts its long, slender proboscis in order to obtain the nectar, we cannot do better than follow the suggestion of Darwin, whose description we have verified in detail. He says: "It is a pretty experiment to push a fine bristle straight into the narrow mouth of the nectary [spur], and to observe how certainly the narrow, elongated, viscid discs, forming the roof, stick to the bristle. When the bristle is withdrawn, the pollinia adhering to its upper side are withdrawn; and as the discs form the sides of the arched roof, they adhere somewhat to the sides of the bristle. They then quickly become depressed so as to lie in the same line with the bristle—one a little on one side, and the other on the other side; and if the bristle, held in the same relative position, be now inserted into the nectary of another flower, the two ends of the pollinia accurately strike the two protuberant stigmatic surfaces, situated on each side of the mouth of the nectary."

Natural hybrids have been found between this species and the Frog Orchis; also between this and the Spotted Orchis.

White Fragrant Orchis (*Gymnadenia albida*).

ALTHOUGH this Orchis has been recorded as occurring in Sussex, it is a distinctly northern form, found as far north as Shetland, locally abundant in the Highlands, and extending south as far as Lancashire and Yorkshire and into North Wales; it appears also in the north and west of Ireland. It is a plant of hilly pastures and the mountain-side, flowering from June to August (Plate 120).

The roots differ from those of the previous species in being a mere cluster of fleshy, awl-shaped fibres, which sometimes coalesce into a palmate tuber. The lower leaves are blunt oblongs, the upper lance-shaped and sharp-pointed. The stem is from six inches to a foot high, ending in a dense spike of small yellowish-white, faintly fragrant flowers. These are very similar in their arrangements to those of *conopea*; but the spur is short and filled with nectar, and the three-lobed lip is turned up, which has the effect of making the flower almost tubular. This makes them available for insects with long or with short tongues, though the latter class have to creep in over the lip.

That the flowers are well patronized by insects is shown by their lack of pollinia after they have been open but a short time. Darwin tells of a spike which he examined, that ten of the lower eighteen flowers had both pollinia removed, and seven others had lost one pollinium. On some older spikes, all the pollinia had been transferred, except from a few of the upper and recently opened flowers.

Green-Man Orchis (*Aceras anthropophora*).

THE early botanists were struck by the resemblance between a frontal view of the flower and those rude caricatures of

3 *Pl.* 110. **Frog Orchis.** (p. 111). *H* 108.
Habenaria viridis. ORCHIDACEAE.

3 *Pl.* III. **Frog Orchis.** (p. III). *H* 109.
Habenaria viridis. ORCHIDACEAE.

the human form which children delight to chalk on walls and pavements. It is one of those counterfeit presentments for which the Orchid family has become famous. It is, perhaps, not so good a representation as in the cases of the Bee and the Fly, for as the Lizard has only one pair of legs, making it more of a Skink than a typical Lizard—so the poor little Green-man is without hands and feet. The body and limbs are furnished by the divided long lip and the big head by the casque-like combination of sepals and petals (Plate 108).

The Green-man must be included among our rarer Orchids, for it is absent from Scotland, Ireland and Wales; and even in England its distribution is restricted to the eastern side, from Yorkshire to the South Coast, but only where the soil is chalky. It is relatively frequent on the chalkhills of Kent, Sussex and Surrey, growing on grassy slopes, and flowering from May to July.

The tubers are oval; the leaves oblong-lance-shaped, the lower with blunt tips, the upper with sharp points, and wrapped entirely around the stem. The slender stem, though varying from eight inches to two feet, usually exceeds a foot. The long spike is not dense, though it supports from forty to fifty flowers. Apart from the singular form, these are not striking or attractive, for the sepals and petals are brownish-green and the lip greenish-yellow. The sepals and petals forming the large hood may be lined and edged with red, with which the long, slender lip is outlined. The latter is cut into four very narrow segments, two at the base, the others by division of the tip. There is no spur, the nectary being represented by two minute depressions at the base of the lip. The bracts are quite small and not very noticeable. Within the flower, the pollinia are found to have very short stalks, and the discs of the two are accommodated in the same pouch

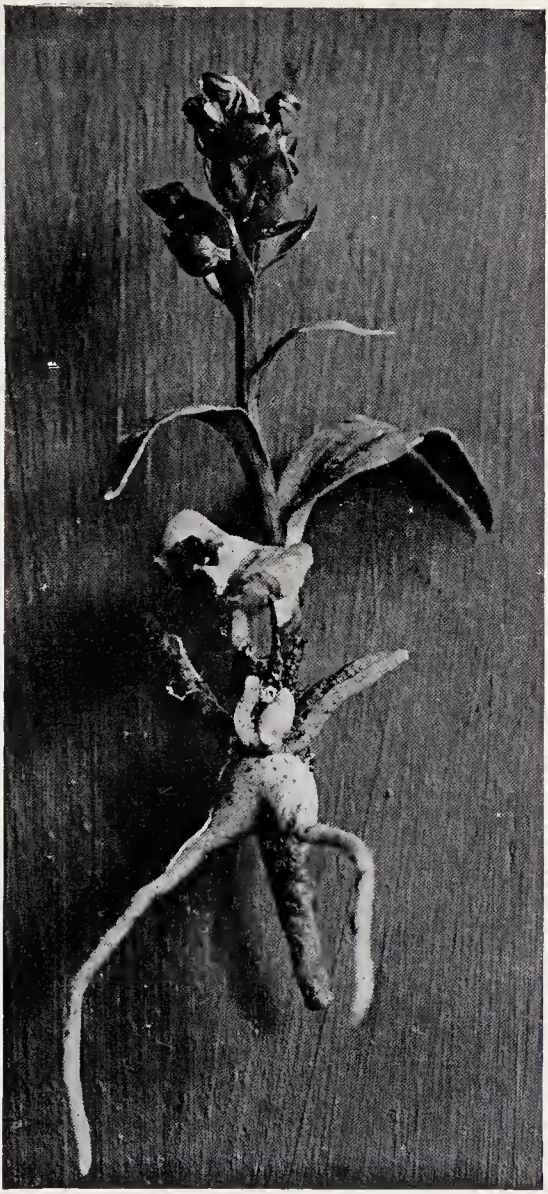
of the column: the pollen-masses droop forward after removal.

The flowers are said to have an agreeable scent; but this is certainly not always evident. The leaves contain coumarin, and in drying give off the odour of new-mown hay: the dry leaves, chewed, taste like vanilla.

Irish Orchis (*Neotinea intacta*).

This little plant, somewhat similar to, but smaller than the White Fragrant Orchis, is one of the small company whose home is around the Mediterranean, but which have contrived to establish an outpost in the West of Ireland. Here, in the neighbouring counties of Clare, Galway and Mayo, alone in the British Islands, the Irish Orchis may be found on the open pastures above the limestone rocks. This is but one of a small group of plants found, some in western Ireland, others in Cornwall, that are thought to have pushed so far from western Europe before our islands were separated from the Continent.

The tubers are egg-shaped and undivided; the oblong leaves spotted or plain. The stem is from four to ten inches high; and the general appearance of the plant is similar to that of the White Fragrant Orchis, but the minute flowers are pink or purplish, the sepals darker than the lip, and the bracts are shorter than the ovary. The flower-spike is cylindrical and dense, sometimes with a spiral twist. The sharp-pointed sepals converge to form a hood over the column; also concealing the narrow petals. The projecting lip is divided into three lobes: the lateral ones short and slender, the mid-lobe broad and oblong, occasionally notched at the end. The spur is very short, almost globular. The pollinia differ from those described previously, in the fact that the pollen-grains are only



3 *Pl* 112. Tubers of Frog Orchis. (p. 111). *H* 110.
Habenaria viridis. ORCHIDACEAE.

3 *Pl.* 113. **Greater Butterfly Orchis.** (p. 114). *H* 111.
Habernaria chloroleuca. ORCHIDACEAE.

slightly connected, and are capable of falling separately upon the stigmas and so effecting self-fertilization. The viscid discs are small, round and far apart, partially concealed by a flat, broad plate arising from the beak. The stigmas are large, fleshy and kidney-shaped, on each side of the beak. The flowers appear in May and June.

Darwin found that, when he carefully excluded insects from access to the plant, almost all of the flowers produced seed-capsules, due to the pollen falling upon the stigmas. He adds : " Nevertheless . . . all the parts are so arranged that, if insects were to visit the flowers, the pollen-masses would almost certainly be removed and carried to another flower, but not so effectually as with other Orchids."

Frog Orchis (*Habenaria viridis*).

In spite of the fact that the Frog Orchis is distributed over the greater part of the length and breadth of the British Isles, it must be reckoned among our rarer species, for its occurrence is only local. It is found on chalk-downs and in hilly pastures. chiefly on chalky and gravelly soils, where it may be found in flower from the middle of May until the end of August. It is quite small and inconspicuous, the brownish-green of its flowers harmonizing closely with its surroundings, and it seldom rises above neighbour grasses and weeds. The popular name causes much disappointment to those who find it for the first time, for they expect to see some resemblance to a hump-backed, four-legged batrachian. If a frontal view of the flower is taken, however, there will be found to be a sort of likeness to the head of the frog with the lobed lip representing its out-thrust tongue. The suggestion in the name is needed to see as much (Plates 110, 111, 112).

The Frog springs from a pair of tubers that are somewhat

oval, but divided below into two or more long, tapering lobes, with fleshy root-fibres above. The stem is ridged, and varies in height from three inches to a foot; the height determining whether the flower-spike shall be dense or loose. The leaves are narrow-oblong, tapering upwards, unspotted, their bases clasping the stem: they may be found in autumn by a very sharp-eyed searcher. The green bracts are longer than the ovary. The sepals and lateral petals at first form a hood closed down and hiding the pollinia and stigma, from which the brownish-green lip is protruded, its tip directed towards the stem; later, the hood opens out, its parts separating, the green petals showing between the purple-green sepals, and revealing the anther-cells and the stigma. The beak is divided, not projecting, so that the stalks of the pollinia and their discs are far apart, with the small stigma occupying a central position. The lip is eight mm. long, brownish-green, bordered with purple; the central portion raised, more so near its base, where it forms a long hump. On each side of the base there is also a curved ridge bordering a depression in which are slits communicating with the short, two-lobed spur, in which there is free nectar. Two glands in the depression between the curved ridges also secrete nectar in drops. These glands are right in front of the pollinia-discs.

It is probable that the discs are attached to the heads of small beetles and short-tongued bees, for whose heads the divergent discs are suited. We have noticed that in older flowers, from which the pollinia had been removed, the centre and base of the lip showed signs of having been gnawed. The attitude of the lip, always directed backwards towards the stem, appears to indicate that the pollinating agent is a crawling insect that reaches the flower *via* the stem.

Lesser Butterfly Orchis (*Habenaria bifolia*).

THERE are two Butterfly Orchids: the Lesser and the Greater, neither of them with a suitable popular name, for in each form the resemblance of the flower is much nearer to a moth than to any of our butterflies. It has been the custom for botanists to regard them as forms of one species; but, apart from differences of size, variations in the structure and disposition of the sexual organs are sufficiently marked to warrant their separation. Intermediate forms which have been considered to connect them are probably hybrids between the two species. In both there is a very long and slender spur, containing free nectar which is accessible only to the long, tubular trunks of moths and butterflies.

The Lesser Butterfly Orchis may be found from May to July, in damp woods and on heaths in most parts of the country. There are two oval tubers which taper below into a long, fibrous root. From the active tuber arise two (occasionally three) large oval or elliptic leaves, tapering below but blunt above. There are two or three others on the furrowed stem, but these are so small and slender that they may be mistaken for bracts. The stem is about a foot high, angular and twisted slightly, the upper part forming a rather loose spike of greenish-white flowers. The broad upper sepal is more erect and less hood-like than in the other Orchids we have described, and covers the two slender petals; the two lateral sepals are broad and spreading, and not symmetrical, for whilst the upper margin has only a slight single curve, the lower has a double, stronger curve, so that the sepal has an outline closely resembling that of an insect-wing. The long, strap-shaped lip is undivided, with the edges recurved somewhat. The slightly curved spur is a little more than

twice the length of the ovary; it has a small, squarish mouth, whose shape and size are due largely to the encroachment of two lateral prominences of the stigma, just below the oval glands of the pollinia. These pollinia are contained in parallel cells of the anther. and have short stalks, from whose attachment a ridge runs to the front of the oval disc. As an additional point of distinction between the two species, attention may be directed to the central line between the anther-cells: here it is a furrow corresponding with a ridge at the back. (In the Greater Butterfly, these points are reversed: the ridge is in front, the furrow at the back.) The pollinia recline in a sloping position, with their feet forwards (Plate 118).

Being fertilized by the agency of nocturnal moths, the flowers become sweetly fragrant, with a clove-like odour, in the evening; and when stem and leaves have been lost among the shades, they stand out distinctly like a little swarm of moths upon the wing. In their quest for the abundant nectar, the moths get the sticky pollinia-glands attached to the base of the proboscis; and that they continue their visits after becoming so encumbered is shown by the fact that they may be captured with several pollinia attached.

Greater Butterfly Orchis (*Habenaria chloroleuca*).

In general, the description of the Lesser Butterfly will stand for the Greater, with certain modifications of the details. As its name implies, it is larger in all its parts, taller and more robust. It occurs in damp woods and bushy places, chiefly in upland districts, especially on chalk; it is more plentiful than the smaller species. Its flowering period extends from the latter half of May to August. The stem-leaves are much larger, less bract-like; the lateral

3 *Pl.* 114. Bee Orchis (p. 117). *I* 114.

Ophrys apifera. ORCHIDACEAE

3 *Pl.* 115. **Bee Orchis.** (p. 117) *I* 115

Ophrys apifera. ORCHIDACEAE.

sepals relatively broader, more yellowish-white, and the downward curving spur is more obviously clubbed at its tip (Plate 113).

When we consider the form and disposition of the sexual organs, we find greater distinctions, fitting them for fertilization by moths of a larger type.

The two anther-cells come near together at the top, but at the bottom are very widely apart. In the centre-line between them there is a prominent ridge corresponding to a groove at the back. The pollen-mass and its stalk are both relatively longer than in *bifolia*, and there is a distinct difference in the attachment of the stalk to the disc. There being no beak in either of the Butterfly Orchids, the viscid underside of the disc projects from the column beyond the broad stigma: in the present species the discs face each other. Here the non-viscid side of the circular disc has a drum-like process; the stalk of the pollinium ends in a curved tail, and is attached to the disc beside the drum, transversely. The object and action of this arrangement were investigated carefully by Darwin; and his description of it must be quoted. He says:

"The drum-like pedicil is of the highest importance, not only by rendering the viscid disc more prominent and more likely to stick to the face of an insect whilst inserting its proboscis into the nectary below the stigma, but on account of its power of contraction. The pollinia lie inclined backwards in their cells, above and some way on each side of the stigmatic surface; if attached in this position to the head of an insect, the insect might visit any number of flowers, and no pollen would be left on the stigma. But observe what takes place: in a few seconds after the inner end of the drum-like pedicil has been removed from its embedded position and exposed to the air, one side of the

drum contracts, and this contraction draws the thick end of the pollinium inwards, so that the [stalk] and the viscid surface of the disc are no longer parallel, as they were at first. . . . At the same time the drum rotates through nearly a quarter of a circle, and this moves the [stalk] downwards, like the hand of a clock, depressing the thick end of the pollinium or mass of pollen-grains. Let us suppose the right-hand disc to be affixed to the right side of an insect's face, and by the time required for the insect to visit another flower on another plant, the pollen-bearing end of the pollinium will have moved downwards and inwards, and will now infallibly strike the viscid surface of the stigma, situated in the middle of the flower beneath and between the two anther-cells. . . .

"The remarkable length of the nectary, containing much free nectar, the white colour of the conspicuous flowers, and the strong sweet odour emitted by them at night, all show that this plant depends for its fertilization on the larger nocturnal Lepidoptera. I have often found spikes with almost all the pollinia removed. From the lateral position and distance of the two viscid discs from each other, the same moth would generally remove only one pollinium at a time; and in a spike which had not as yet been much visited, three flowers had both pollinia, and eight flowers had only one pollinium removed. From the position of the discs it might have been anticipated that they would adhere to the side of the head or face of moths; and Mr. F. Bond sent me a specimen of *Hadena dentina* [Shears Moth] with one eye covered and blinded by a disc, and a specimen of *Plusia v. aureum* [Golden-Y-moth ?], with a disc attached to the edge of the eye. Mr. Marshall collected twenty specimens of *Cucullia umbratica* [Shark Moth] on an island in Derwentwater, separated by half a mile of water from any spot where [the Greater Butterfly]

grew ; nevertheless, seven of these moths had the pollinia of this Orchid affixed to their eyes."

From his close consideration of the great differences in the sexual organs, Darwin was quite convinced that the two Butterfly Orchids are distinct species, in spite of the opinion of eminent botanists of his time that they were merely forms of one species.

Bee Orchis (*Ophrys apifera*).

In the small group of four British species of the genus *Ophrys*, we again meet with rather remarkable examples of counterfeit presentment of insects. The tubers of the several species are more or less oval ; but in other respects the plants exhibit some distinct departures from the species described previously. The flowers are very few on a spike. The sepals do not converge to form a protecting hood over the pollinia : this office is served by the anther at the top of the column arching over them. The sepals, with the lip, are the most conspicuous parts of the flower—the petals being reduced to small dimensions ; there is no spur, and the ovary is not twisted—the reversal of the flower being effected by a twist of the short flower-stalk (Plates 114, 115).

The Bee Orchis is the best-known of this group, from its appearance often in great numbers on the slopes of the chalk and limestone hills ; sometimes also in pastures and copses, even in places deficient in these soils. It is restricted, however, in its range geographically, being absent from Scotland and the extreme north of England ; and in Ireland appearing only in the middle and south. The lower leaves are short, oblong-lance-shaped, clasping the stem ; the stem-leaves narrower. The stem varies in height from four to eighteen inches, but is most frequently five or six inches only. Usually, there are only from two

to six flowers on a spike, but there may be as many as nine; these are placed well apart, and as a rule only two or three are open at one time. The bract at the base of each flower is large and leaf-like. The sepals are pink, broad and spreading, with a greenish line down the middle; but the petals are quite small, narrow-oblong, with straight sides and blunt tip, downy, purple or green. The broad, convex lip has five lobes, of which the furry basal pair are most distinct; the fifth is a small terminal appendage, usually inconspicuous from being turned under, but occasionally made very prominent by being turned forwards. The ground colour of the lip is deep yellow, overlaid with velvety patches of purple-brown or brownish-green, leaving a pattern in yellow that includes, in most cases, a collar around a depression below the stigma. As may be seen in several photographs of the flower, the distribution of the yellow and brown produces varied patterns. The arching anther ends in a hook-like beak above and in front of the cells which contain the pollinia. As soon as the flower expands, the anther-cells open, and the pollinia on their exceptionally long, thin stalks droop forward and hang on a level with the stigma. Any little wind movement serves to sway the pollinia against the stigma, effecting self-fertilization.

Clearly, the Bee Orchis stands in no need of insect assistance in order to produce fertile seeds, for though the plant be covered with a net to exclude insects whilst admitting the wind, all the flowers will develop full seed-pods: just as we find is the case with most of the "Bees" that we may examine upon any chalkhill. Darwin came to the conclusion that, judging from the structure of the flowers, "it seems almost certain that at some former period they were adapted for cross-fertilization, but that failing to produce a sufficiency of seed they became slightly modified

3 *Pl.* 116 **Early Spider Orchis** (p. 121). *I* 118.
Ophrys sphegodes. ORCHIDACEAE.

3 *Pl.* 117. Early Spider Orchis. (p. 121) 119.
Ophrys sphegodes. ORCHIDACEAE.

so as to fertilize themselves." Except in one respect, the whole structure of the flower shows its design originally for cross-fertilization. Although now habitually self-fertile, by the elongation of the pollinia-stalks allowing the pollinia to dangle in front of the stigma, it must still be crossed occasionally, if we are to accept the evidence of what are considered to be natural hybrids between this and one or other of the two Spider Orchids.

Many attempts have been made to explain the likeness of the flower to a bee: some affirming that the purpose was to *attract* actual bees and so ensure cross-fertilization; others that, the flower being self-fertile, the resemblance was intended to *keep off* bees by giving the impression that one was in occupation already. Another view is that the counterfeits prevent browsing beasts from cropping the plant by inspiring fear that the supposed insect might sting their lips. Quite recently, a writer in *The Times* stated that, though the grass all around might be cropped as closely as any lawn-mower could make it, the Bee Orchis would be left intact. The statement was not allowed to pass unchallenged: the Rev. G. Engleheart replying that, in the Salisbury district, "whole breadths" of the orchis in flower were eaten off by sheep. It must be within the experience of most field botanists that the plants frequently show signs of such mutilation; and the absence of the flowers in some seasons, from places where they are abundant usually, is often due to the plants having been eaten off in previous years.

Nearly a hundred years ago, a Mr. Price (according to Smith's *Catalogue of the Plants of South Kent* (1829) quoted by Darwin) frequently witnessed attacks made upon the Bee Orchis by a bee similar to *Bombus muscorum*. Darwin could not make anything of the reference; but in the light of recent observations made by M. Pouyanne in

Algeria, on other species of *Ophrys*, it looks as though Mr. Price's bee was a male that mistook the flower of *O. apifera* for a female of its own kind. This, which would explain the likeness between the flower and the bee, is the interpretation of Col. Godfery, who calls attention to Pouyanne's note (*Journal of Botany*, 1921, p. 286), which he has since verified by his own observations at Hyères. It is probable that a close watch upon the Bee Orchis in this country would reveal the hybridizing agent. Hitherto, it may be, botanists have failed to do this owing to Darwin's remark: "Long and often as I have watched plants of the Bee Ophrys, I have never seen one visited by any insect."

The Bee Orchis is in flower in June and July. A variety with white flowers has been recorded. The mature seed-capsule is an inch and a quarter long.

Late Spider Orchis (*Ophrys fuciflora*).

THE position of the Late Spider is somewhat doubtful, some authorities regarding it as a sub-species of the "Bee"—a stage of evolution between variety and species—others recognizing it as a distinct species. Whichever view we take, we must recognize its near affinity to the "Bee," with which it agrees generally. The more noticeable points of distinction lie in the lip and the petals. In the "Bee," the petals are narrow, parallel-sided, with blunt tips, and the lip is only equal in length to the sepals, with the terminal appendage turned under and not visible from above. In the flower of the Late Spider, the pinkish sepals are greenish down the middle, the petals are broader at their base and the sides converge to a point. The lip exceeds the sepals in length, and the flat, somewhat heart-shaped appendage is either straight or curved upwards. There are other differ-

ences, less obvious on a cursory inspection, but, perhaps, more important as being concerned in the reproductive process. These naturally impressed Darwin during his investigation of orchid fertilization; and he pointed out that the anther-cells do not stand so high above the stigma or overhang it so much, that the pollen-masses are longer and their stalks much shorter than is the case with the Bee. The stalk is also more rigid, and the pollinia never fall out of their cells spontaneously. He considered that these facts pointed to the Late Spider's closer affinity with the Early Spider rather than with the Bee.

The Late Spider Orchis is a rare plant that occurs in similar situations on chalkhills to those favoured by the Bee; but its distribution at present is restricted to a few localities in the county of Kent. In former times, it was reported also from certain Surrey chalk districts; but these appear no longer to produce it. It is in flower in June and July.

Early Spider Orchis (*Ophrys sphegodes*).

In general habit similar to the "Bee," the Early Spider has less brightly coloured flowers; but it is sufficiently attractive for a dead set to be made upon it by the thoughtless flower-pickers of the localities where it flourishes. These places are not numerous in this country, where its area of distribution can be marked on the map by drawing a line connecting Northamptonshire with Suffolk, and extending each end southward to include Dorset and Kent respectively. It is found upon slopes and about copses on chalk and limestone; and flowers from April through May to early June. It is a smaller plant than the Bee, and has fewer flowers on a spike. The name disposes us to see some resemblance to a spider in the furry, convex

lip; though it is doubtful whether moderately observant persons would see the likeness but for the suggestion.

The root-leaves, of which there are four or five, are about an inch long, oval with a long point; the stem-leaves longer and narrower, the parallel nerves strongly marked. The stem varies from four inches to a foot high, but is mostly less than six inches, bearing three or four flowers. Though in form sufficiently similar to those of the Bee to denote the close relationship of the two species, the flowers of the Early Spider are in fact quite different: for the petals and sepals are yellow-green, the petals narrow-oblong, greener than the sepals and sometimes edged with purple; the broader lip three-lobed, without a terminal appendage, the tip being either notched or slightly pointed. The lateral margins of the lip, though depressed, are not turned under. The greater part of the upper surface is covered with purple-brown velvet when the flower is newly expanded, giving the lighter central markings a sunk and shining appearance. These marks differ both in form and colour in different examples; and after the flower has been open for a day or two the purple-brown pales to a dull purplish-green, and, later, to yellow-green. The seed capsule is an inch long (Plates 116, 117).

In some of the older books, the smooth markings of the lip are said to take the form of the capital Greek letter Π, but this must not be looked for as a distinguishing character, for there is a considerable amount of variation in this respect, as in the other species of *Ophrys*. In some specimens it is as like an ornamental W or H.

The viscid glands of the pollinia are accommodated in separate pouches of the beak; and from the open character of the anther-cells the pollinia themselves are liable to be shaken out, though not in such manner as to cause self-fertilization, as in the case of the Bee. We have

3 *Pl.* 118. **Lesser Butterfly Orchis.** (p. 113). / 122.
Habenaria bifolia. ORCHIDACEAE.

3 *Fl.* 119. **Fly Orchis.** (p. 124). *I* 123.

Ophrys insectifera. ORCHIDACEAE.

found them adhering to the distant edge of the lip. There is no secretion of nectar; and the shining protuberances found at the base of the lip in all our species of *Ophrys* do not appear in this case to impose upon insects by offering the prospect of moisture. Judging from the experience of Darwin, and our own limited observation, the flowers are not visited frequently: of fourteen examined by him, only three had lost a single pollinium, and in no example were both cells empty, but in some of those that were intact he found evidence of visitors in the fact that they had left upon the stigma pollinia brought from other flowers.

We suspect that in some way self-pollination is effected, in some cases at least. Of three plants kept under observation in May, 1927, each produced a three-flowered spike. One plant failed to develop either of its ovaries; of the others, one bore two capsules, the other one capsule, but only one ripened its seeds, which were released in July. In these three cases it was noticed that, as the flower began to fade, the lip was raised and the anther depressed until they were almost in contact. The pollinia had been removed or had fallen out; yet in neither of the three were there pollinia on the stigma. If cross-pollination had been effected, it could have been only partial, by means of a few grains detached from pollinia that remained attached to the insect, but the stigmas no longer afforded evidence of such pollen.

Recorded observations on these local Orchids are few: many more, made through a series of years, are needed before anything very definite can be said as to the fertilization methods of each. The Early Spider bears at least as many seeds as will enable it to keep up its numbers in its chosen localities, though apparently not to extend its distribution. It might be enabled to do so, perhaps, if its flower-spikes were not gathered so assiduously. It has

been noticed particularly of this species and the Bee that, in their regular stations, a year or two may pass without any of the flowers appearing. This is due to the fact that in a previous season all the stems had been gathered; the small, roundish tubers, in consequence of this loss of material, have been unable to renew themselves fully, and have been reduced to the condition of young plants, requiring several years of further growth and the building up of the reserves necessary to enable them to regain flowering strength.

Fly Orchis (*Ophrys insectifera*).

THE Fly Orchis gives us our best impressionistic representation of an insect resting on a plant; but, like all impressionistic pictures, it must not be examined too closely or in detail. Superficially, and at a little distance, it is admirable; and the imposition is the greater for not being overdone. The flowers are few—commonly six or eight, but they may exceed a dozen—and only two or three are exhibited at the same time, the "flies" sitting at different angles (Plate 119).

The Fly is another of our Orchids that do not favour Scotland; and even the two most northern of the English counties are without it; in Ireland it occurs in the middle and the south, but is very, very rare. Its principal haunts are about copses and thickets, usually in shade, always on chalk or limestone, where it may be found in flower from about the middle of May to the early part of July. The plant varies in height, mostly between four inches and a foot, but may be as much as a foot and a half. The smaller measurements, however, are the more usual. The few leaves are narrow oblongs; the slender bracts are twice the length of the ovary. The spreading, narrow, yellow-

green sepals form no part of the fly imposition, but are rather a flower upon which the fly has settled. The extremely slender petals are dark purple and downy, their fineness and attitude serving well for the fly's antennæ. The velvety lip is long, narrow and four lobed, the sides sloping a little; the colour a dark red-purple, with a band of violet across the centre. Occasionally, plants may be found with the flowers entirely white. When normal flowers have been open for a day or two, the lip becomes dark brown, then yellow-brown, with a darker border, and the violet patch turns a dull white. Sometimes, the violet band is outlined in yellow. Failing the visits of insects the flowers retain their freshness for many days: each plant remains in flower for about a month.

The pollen-masses are almost round, and their stalks have two curves, the lower one throwing them back from the large, prominent pouches in which the viscid glands are held, whilst the upper curve maintains the pollen-mass in an erect position. The pollinia are held so firmly by the anther-cells that they cannot be shaken out; so there is no possibility of self-fertilization by their drooping over against the stigma, as occurs with the Bee Orchis—though the Fly is little visited by insects and seems to need some such aid in the production of seed. Darwin marked eleven plants, which together bore forty-nine flowers; but of these only seven produced seed-capsules. In spite of this seeming defect sufficient seeds are perfected each year to enable the plant to keep up its numbers within its geographical range: and the self-fertilized Bee—though its numbers are greater—does no more by producing a full capsule for every flower.

The tubers are quite small, irregular ovals. Suspected hybrids between this and the Early Spider have been reported.

Musk Orchis (*Herminium monorchis*).

THIS very small Orchis is another of those that are restricted in their British distribution to the south-east corner of England, and it is there very rare; though, where it occurs, it is in fair-sized companies. In appearance, it is so different from the other Orchids that it is not calculated to make any appeal to the posy-hunters. It should be sought upon grassy slopes of the chalkhills in June and July, when it is in flower; but, owing to its inconspicuousness, it is not found without difficulty (Plates 122, 123).

In our previous descriptions, the tubers in nearly all the species are found in pairs at the base of the stem, that which furnished the season's growth more or less wrinkled and depleted, the other becoming larger and firmer as it accumulates a reserve for next year's activity. The Musk Orchis, like the Green-winged Orchis, has only one small, roundish tuber below the stem; the other (or others) at the extremity of the horizontal fibrous roots, an inch or two inches distant in this case. By this means the plant is able to reproduce itself vegetatively, as well as by means of seeds. The fact that there is only one tuber at the base of the stem caused the plant to be misleadingly named *monorchis*.

Usually there are only two, but there may be three, smooth, shining, sharp-pointed oval leaves, whose lower ends sheath the base of the stem, and at some distance above is a solitary, very slender stem-leaf or long bract—sometimes duplicated. The shallow-grooved stem, though appearing fragile, is really tough; it varies in height from two to ten inches, but commonly is not more than six inches; and the flower-spike may be loose or dense. Hooker describes it as "rather lax"; Babington as

3 *Pl.* 120. **White Fragrant Orchis.** (p. 108). *I* 126.
Gymnadenia albida. ORCHIDACEAE.

3 *Pl.* 121. **Autumn Lady's-tresses.** (p. 130). *I* 127.

Spiranthes spiralis. ORCHIDACEAE.

"dense." As one of our photographs shows, the same cluster of plants will afford examples of both types, also of various heights of the plant. We have counted as many as fifty flowers on one spike. The sharp-pointed flower-bracts are about the same length as the ovary, but variable on the same spike. As will be seen later, the general appearance of the spike is suggestive of that of Lady's Tresses without the spiral arrangement of the minute pale greenish-yellow flowers. The yellow is not sufficiently pronounced to allow the flower-spike to stand out from its surroundings.

Without dissection of the flower, it is not possible to see the disposition of its parts, for all the segments converge to form a slightly drooping tube. The sepals are oval; the petals narrower and longer with a lobe on each side. The lip is divided into three slender lobes, of which the middle lobe is the longest; there is a depression at its base, but no spur, and no free nectar is provided. This does not seem to be fair treatment of the insects that assist in its fertilization, for the scent that has been considered to be like that of musk (hence the popular name) is described by Darwin as "a strong honey-like odour," and therefore holding promise of refreshment. It is especially strong in the evening after rain, and attracts many small insects —flies, beetles and hymenoptera.

The column, to which the anther is united, has short arms at the sides. The pollinia have very short stalks, which are far apart at the base, where the unusually large and somewhat triangular disc rests upon and is partly concealed by a narrow strip of membrane representing the pouch. The stigma is in two parts, placed at the sides under the discs, but meeting in the middle.

The insects which carry off the pollinia and transfer them to other flowers are all exceedingly minute—chiefly

hymenoptera and coleoptera. Owing to the closeness of the centre part of the lip to the anther and the stigma, visitors have to enter the depression from one side ; and this leads to a peculiar method of attachment of the pollinia. Sir George Darwin, who captured twenty-seven of the insects with one or both of the pollinia attached, found that these were glued invariably to the upper part of the front thigh or the connecting joint above it. In this position, after the usual drooping forward, the pollen is bound to be smeared upon the stigma of the flower next visited. In the absence of suitable visitors, the flowers on one spike will remain fresh for five or six weeks. The plant, perhaps in consequence, produces an abundance of seeds.

A curious fact will strike the seeker for Musk Orchis on the hillside : it frequently has for a companion the Man Orchis, and often the Twayblade in addition. At a short distance, the three are much alike, and the Musk Orchis, though much smaller than the others, may be thought to be a " Man " just beginning its development. A very brief glance at closer range will suffice, of course, to distinguish one from the others.

Creeping Lady's-Tresses (*Goodyera repens*).

So many of our Orchids are restricted in their distribution to the southern parts of the country that it is somewhat of a relief to turn to one that is almost exclusively a Scots species. The Creeping Lady's-tresses comes south into Cumberland, and quite recently was reported as occurring in Norfolk ; otherwise, it is found only in the pine-forests of eastern Scotland, where however it is abundant in certain localities. (Plate 124).

There are no tubers, the perennial portion of the plant

consisting of a creeping rootstock with a few fleshy fibres, which interlace and mat among the damp pine-needle humus and moss. The small, dark-green leaves are oval, veined with brown, and downy on the underside ; the lower ones with short, broad stalks. The slender stem varies from four to ten inches in height ; the upper part covered with glandular down, which extends to the flowers. The narrow, lance-shaped bracts have long sharp points, and are longer than the ovaries. The flower-spike is one-sided, the crowded, creamy-white flowers all turning in one direction. Some have the ovary twisted : others straight. The flowering season is July and August.

The structure of the flower is peculiar, in that the sepals, petals and lip are much alike, and none of them spreads widely. The upper sepal and petals form a hood over the pollinia, and the side sepals, which are lobed on their lower margin, embrace the short, turned-down lip. The base of the lip is inflated, forming a hollow that suggests the beginnings of a spur, for it is filled with nectar.

Before the flower opens, the anther-cells set free the pollen-masses, which have no stalks, the pollen-grains being connected loosely into triangular parcels, which in turn are untied to form the mass by elastic threads which cohere in a ribbon attaching them to the back of the beak. The stigma is an exceedingly adhesive disc below the beak. When the flower is newly open, the beak is very close to the lip, apparently to make the removal of the pollen more certain ; later, the column moves back, allowing more space between the lip and the beak for the entry of insects burdened with pollinia. Humble-bees have been seen performing this useful work.

Autumn Lady's-Tresses (*Spiranthes spiralis*).

In England a local plant, but usually abundant where it occurs at all, the Lady's-tresses has not spread farther north than Westmorland and Yorkshire; Scotland knows it not; and in Ireland it is rare, being found only in the south and middle. It is a plant of fairly dry soils, chalk, gravel and sand: its favourite locations grassy slopes, downs, pits, pastures and heaths, where it flowers in late August and September, some of its southern stations on the chalk-slopes being identical with those of the Adonis Blue butterfly(Plates 121, 125, 126).

The tubers are tapering oval-oblong in shape, like young carrots, and there are either two or three of them, with a few thin root-fibres above them. The third tuber is a departure from what we have found in the Orchids described previously; and we shall find a further difference in the development of the plant above ground. From a three-tubered plant there may be two flower-stems. The flowering spike appears to be without root-leaves; but, if we trace the stem to its base among the grass, we may find their withered remains. Close against one side of the stem we shall discover a hollow roll of two or three very fresh, developing oval-oblong leaves, which will spread later, and from their centre will arise *next year* the new flowering stem. This new shoot arises from the same tuber as the old stem, on the other side of which may be a second shoot. When expanded fully, these root-leaves are only about an inch long; there are five or six narrower leaves on the stem, which they enwrap closely, the upper ones bract-like and tapering to long points like pen-nibs. The stem is covered with a dense coat of short white hairs, and varies from three to nine inches in height, of which two inches

3 *Pl.* 122. **Musk Orchis** (p. 126). *X* 130.
Herminium monorchis. ORCHIDACEAE.

3 *Pl.* 123. **Musk Orchis.** (p. 126). *K* 131.
Herminium monorchis. ORCHIDACEAE.

or more may be flower-spike, with a single crowded, spiral line of small white flowers, slightly tinged with green, and very fragrant. In some examples the spiral is much more pronounced than in others.

The upper flowers have their ovaries twisted slightly, but the lower ones having a short stalk the twist is here instead of in the ovary. Each flower has a broad, hairy bract curving over it, whose lower part encloses the ovary.

The structural arrangements of the flower are different also from those of the species foregoing. There is little distinction between sepals and petals apart from their relative positions. All of them are directed forwards, and are only five mm. long. The two petals are united to the upper sepal, and with the lip and the lower sepals form a tube whose mouth is four mm. wide. The lip has its sides turned up strongly, forming a broad green trough margined with white, and the long turned down tip has a glistening white fringe; its base is inflated to form a basin, into which flows nectar secreted by two bosses at the sides of the channel. Into the tube so formed projects the column lengthwise, and to the back of this the anther is hinged. In front of the anther stands the long, thin beak, upon which lies a minute brown, elongated disc; and below the beak is the sloping stigma. Both beak and stigma face the lip-channel, and lie so close to it that only a slender passage is left open to the nectary: it is just sufficient to allow the proboscis of a humble-bee to pass.

Instead of the pollen being compacted into a pair of pear-shaped or globular pollinia with stalks, as we have seen in other Orchids, each anther-cell here contains two little sheets of powdery pollen, their edges connected slightly by a few threads. There is no stalk. Before the flower opens, the anther-cells—which at this stage are pressed

against the beak—part slightly, so that the pollinia attach themselves by their threads to the disc on the beak. When an insect seeks the entrance to the nectary, it is bound to touch the tip of the beak, which splits immediately, and the rupture is accompanied by a flow of adhesive fluid, by which the disc with the pollinia is attached securely to the insect's proboscis. A day or two later, the column moves back sufficiently to enlarge the entrance to the nectary so that a bee which has brought pollinia from a younger flower has room to push them against the stigma. Until the column moves back this is not possible.

The method of humble-bees in working a spike of flowers is well known : they start at the bottom where is the oldest flower, and work upwards to the youngest flower, whether it be on the enormous spray of the Foxglove or the little spike of the Lady's-tresses. In the upper newly opened flower, they get the face or proboscis decorated with pollen ; the older flower to which this is transferred must be low down on the spike of the next plant visited, and cross-fertilization is assured. Self-fertilization is not possible in this species.

Darwin has given a long and very detailed account of the sexual organs in this plant, but probably owing to the small size of the flower, it is by no means easy to follow it with satisfaction.

Summer Lady's-Tresses (*Spiranthes æstivalis*).

This species is not only one of the rarest of British Orchids, but it presents a strong contrast in its chosen habitat to that of the Autumn Lady's-tresses. That selects a dry situation and an alkaline soil ; this is an inhabitant of bogs, where it grows among Sphagnum-moss under acid conditions. Its only recorded localities in England are

3 *Pl.* 124. **Creeping Lady's-tresses.** (p. 128). *K* 132.
Goodyera repens. ORCHIDACEAE.

3 *Pl.* 125. **Autumn Lady's-tresses : tubers.** (p. 130). *K* 133.
Spiranthes spiralis. ORCHIDACEAE.

Wyre Forest in Worcestershire and the New Forest, Hampshire. Before either of its English haunts had been discovered, it was made known by Babington as occurring in Jersey. It is not known in either Scotland or Ireland; elsewhere it occurs only in Western Europe and North Africa (Plate 126).

It is a larger plant than the Autumn species, the stem often attaining the height of a foot and a half, with leaves and flowers both on a larger scale. There are several tubers, which are larger and more cylindrical than in the previous plant, and they take a more horizontal direction. The root-leaves will be found in this species still around the base of the stem when the flowers are out: they are slender-oblong; the stem-leaves are small and narrow-lance-shaped. The stem is smooth, but the flower-spike is downy. Here, also, the flowers are white and in a single series arranged spirally, but they are less crowded. Individually considered, they are similar to those of the commoner species, but the lip is relatively larger. The flowering season is July and August: so that, although this precedes the other, they may be found flowering at the same date in August, though not in the same place.

Recently, the Summer Lady's-tresses has been reported to be extinct at Wyre, and nearly so in the New Forest; but, given the survival of the bogs in these neighbourhoods, there is always a hope of the plant's reappearance, as in the case of the next species in Ireland and of the Lizard Orchis in England. It is to be hoped that collecting botanists will exercise self-denial, and so help to save these rarities to our wild flora. In this case there is no need to appeal to the others, for the appearance of the simple spike of small white flowers in the midst of a treacherous bog would not be attraction sufficient for the ordinary wild-flower gatherer. It would be a very good thing if the

few haunts of these exceedingly rare species could be constituted as botanical reserves, where the man with the vasculum would be kept outside.

Cork Lady's-Tresses (*Spiranthes gemmipara*).

From several points of view, this must be considered as one of the most remarkable and interesting of our native Orchids. Few persons, even among botanists of great experience, have had the opportunity of seeing it in the living state: for until recently its status as a European plant was based on several examples found long ago in County Cork. Here, about the year 1810, Mr. J. Drummond, the Curator of Cork Botanic Gardens, found the plant growing in a salt-marsh near the shore of Bantry Bay. Apparently, the two plants he brought away constituted the entire colony, for no one else succeeded in finding specimens until about thirty years later, when the plant reappeared in the same neighbourhood; later still, other Co. Cork localities were discovered; and it was found by Mr. R. W. Scully in Co. Kerry (Plates 127, 128, 130).

Owing to a phrase in Drummond's description which led to the belief that it propagated itself by means of offsets, Lindley gave it the name of *Spiranthes gemmipara*. The supposed offsets could have been only the shoot-bud formed on the new tuber for the next year's growth: this is in evidence already when the plant is in flower, just as it is in the Autumn species. Babington thought the plant was only new as a British species, and considered that it was identical with the North American *Spiranthes cernua*; but Asa Gray was sure it must be referred to another American species, *Spiranthes romanzoffiana*. The difficulty experienced by these authorities in identifying the plant with one known already, was due to the paucity and

poorness of the material available for judgment. What this amounted to may be gathered on a comparison of Sowerby's figure in the carefully illustrated *English Botany* with the photograph reproduced in the present work. Sowerby's drawing had to be made from a dried specimen whose leaves were separate and broken, and the flower-spike was in the early unexpanded state ; both spike and foliage have little, if any, resemblance to the photograph, which represents the living plants brought from Cork by Mr. A. J. Wilmott, F.L.S., to whose kindness we are indebted also for the opportunity to portray this and the next species side by side for more effective comparison.

In the year 1892, Mr. R. Lloyd Praeger, botanizing around Lough Neagh, in Northern Ireland, came across what was considered to be the same plant. Thirty-four years later (July, 1926), Messrs. F. Druce and A. J. Wilmott made search around the old Bantry Bay locality, and found what they sought, though not on the same spot. They found the plant also in Co. Kerry. Then, with living plants in their possession, they hastened northwards to Lough Neagh, and there obtained other Lady's-tresses, presumably the same as that which Praeger had found. There was now, for the first time, an opportunity of placing the living plants from the two districts side by side and comparing them point for point. Seen thus, it appeared to be tolerably certain that they represented two distinct species : the southern plant *S. gemmipara*, and the northern one some other. The latter species we will leave for the moment.

Cork Lady's-tresses springs from a pair of long cylindrical tubers : new ones for next year's growth being found whilst the plant is still in flower, with the remains of this year's supply. There is a tuft of slender leaves around the base of the stem, with others loosely wrapping and covering

the stem almost up to the flower-spike. The outer root-leaves are shorter and broader than the inner ones, which have long, sharp points. The stem is five or six inches high; and before the opening of the flowers the spike is twisted. The large bracts on the slightly downy spike are very distinctive: like those of *S. spiralis*, they are shaped like pen-nibs, are of equal length with the flowers, and overlap closely, as well as covering the ovaries completely. The open flowers are not arranged spirally, but in three straight, crowded rows: they are white, with the fragrance of vanilla. They may be looked for late in July and early in August; but the districts named are the only known localities for them.

A fuller description of the flower-structure may be added. Sepals and petals are of equal length; they converge to form a long hood over the sexual organs. The lateral sepals, owing to the grip of their lower margins, restrict the spreading of the broad, middle part of the long tongue-shaped lip, converting the flower into a tube. The lip expands again towards the toothed tip, and is streaked faintly with yellow.

Rydberg's Lady's-Tresses (*Spiranthes stricta*).

At present, this Orchid is known only (so far as this side of the Atlantic is concerned) as occurring among grass in the neighbourhood of Lough Neagh, in Northern Ireland, as mentioned in the account of the previous species. There can be little doubt, of course, that the two Orchids are related closely; but there are differences that are appreciable at once when the plants are brought together, and these are apparent in the accompanying photographs. From these it will be seen that the present species is much the taller and more graceful, the height of the specimens

3 *Pl.* 126. **Summer Lady's-tresses.** (p. 132).
Spiranthes aestivalis.

Autumn Lady's-tresses. (p. 130). *K* 136.
Spiranthes spiralis.

3 *Pl.* 127. **Cork Lady's-tresses.** (p. 134). *K* 137.
Spiranthes gemmipara. ORCHIDACEAE.

depicted being one foot. It had been considered identical with *Spiranthes romanzoffiana*, which occurs right across North America and reappears in Kamtschatka, but nowhere else. Wilmott, however, identifies it with the *Gyrostachys stricta* of Rydberg ; and as the genus *Gyrostachys* has been merged in that of *Spiranthes*, the plant should be known as *Spiranthes stricta* (Plates 128, 130).

The cylindrical tubers are much stouter than those of *gemmipara*, and there are from three to five of them, as in Summer Lady's-tresses. In the photograph, there are five, of which the dark one is all that is left of those which provided that year's growth ; the others are to continue the individual life into the next season, the long winter-bud being ready formed beside the base of the old stem. The lowest leaves, whose bases wrap the stem, are narrow-lance-shaped, about five and a half inches long ; the stem-leaves are progressively more fully rolled around their support, and the upper ones have only their long-pointed tips free.

The flower-spike, which is three inches long and more obviously downy than in *gemmipara*, though retaining the three-ranked arrangement of the flowers, is much less dense, but the individual flowers are larger, whiter, and the yellow lines on the lip are much stronger. The bracts are longer than the flowers, are less flat, and have not the neatness of their overlapping shown in the Cork plant. The fragrant flowers appear in July and August.

The structure of the flower is similar to that of *gemmipara*. At its partial opening, the lip, which is more constricted in the middle, is bent up against the column, leaving only a narrow passage, through which the tips of the pollinia are visible as they lie on the back of the beak. When the flower opens fully, the hood curves strongly upwards and the lip turns outward and downward, distending the mouth

of the tube. At the same time, the column moves back from the base of the lip, revealing the underside of the beak and making the stigma accessible to an insect primed with pollinia from another flower. It must be dependent entirely upon insect aid for pollination; but on this side of the Atlantic at least, the insect agent has not yet been identified.

Mr. Henry Mousley has contributed to *The Orchid Review* (1924) some interesting notes on the species (under the name of *S. romanzoffiana*) as he finds it in Canada, where it is much more plentiful than on this side. He writes in the belief that his plants are of the same species as those from Cork described in most of the British floras; but it is quite clear from an examination of his photographs that they are identical with those found at Lough Neagh. He appears to consider that the differences in stature, etc., are due to a moister habitat, for he says that in one part of his district, in drier ground, he obtains forms that agree closely with tracings from the original preserved Cork plants—with thicker tubers and broader leaves. In his experience, there may be as many as twelve tubers to one plant.

Most of Mousley's photographs show the tubers disposed more or less horizontally, which appears to be their natural direction when growing in wet soil; in drier ground, they take a downward course, evidently in order to reach damper conditions. These more vertical tubers are stouter than the horizontal ones. In the event of drought, it appears that the plant retains its freshness by drawing upon the moisture contained in these tubers, the depletion causing shrinkage.

In Canada, the flowers appear to be pollinated by small bees, of species not represented in Ireland.

Twayblade (*Listera ovata*).

FROM the rare Irish Orchids we turn to one of the commonest and most widely distributed on our list. The Twayblade occurs in all parts of the country, in damp woods, pastures and green lanes, as well as on chalk slopes in company with the similar-looking Man Orchis ; and it may be found in blossom from May to July : the great number of flowers, opening in succession, enabling each plant to prolong its display. Often it is in great companies in the woods ; yet it seldom attracts much attention from the public, who may regard its large leaves as belonging to some coarse kind of plantain, and its small greenish flowers as lacking in interest or beauty. Yet, the great Darwin, who had so long and intimate an acquaintance with the Orchids, pronounced it as " one of the most remarkable in the whole order " (Plate 129).

There are no tubers, the rootstock being represented by a bunch of long, fleshy fibres ; there are no root-leaves. As the popular name indicates, the plant has usually only two leaves (rarely there is a third), and these are placed as an almost opposite pair three or four inches up the downy stem. These leaves are broadly elliptical, with parallel ribs ; they are commonly three or four inches long, but may be as much as eight inches, with a peculiar small, claw-like point at the tip. The stout stem is densely covered with glandular down, and usually a foot high, but often two and a quarter feet, the upper part a spray of small yellow-green flowers, of which there are from thirty-five to eighty. About three inches above the leaves there is a peculiar short, bifid bract, and an undivided one two or three inches above it ; their purpose is not evident.

Each flower stands upon a footstalk as long as the short,

ribbed, untwisted ovary, mostly hidden by the short, pointed bract below it. The sepals are fully green, but the petals and lip have a good deal more yellow in their tint; the upper sepal curves a little over the column, but the petals and lateral sepals are more spreading. The lip is very long and narrow, divided from the tip nearly half-way into two straight lobes. Above the slit, in the central line, there is a slightly raised longitudinal stripe in which is a fine furrow whose margins pour out nectar. The attitude of the lip is peculiar: the narrow base stands out horizontally from the column, then there is an acute bend downwards, so that the greater part of it hangs vertically. There is no spur, but a depression at the base of the lip holds nectar.

The column has a broad expansion at top, beneath which the anther is hinged. Before the flower expands, the anther-cells open to set free the pollinia, whose grains are only lightly connected by weak threads. The beak is thin and tongue-shaped, arching over the stigma; but at first it is more erect, keeping the pollinia from falling. The cells of the beak are turgid with liquid cement; and the slightest touch, even with a hair, causes them to explode. Before this happens naturally—by insect agency—when the anthers have released the pollinia and they lie with their tips on the tip of the beak, the latter curves forwards slightly over the stigma.

The glandular coating of the stem—continued sparingly over the ovary—is intended, probably, to prevent ants and other crawlers from getting access to the abundant nectar. Very small flying insects—chiefly hymenoptera and diptera—attracted by the odour of nectar, alight on the lip and creep upwards, the nectar-yielding furrow keeping them to the centre. The head touches the point of the beak, which explodes, moistening at once with cement the

3 *Pl.* 128. Rydbergh's Lady's-tresses (*right*). *K* 140.
Spiranthes stricta *contrasted with* Cork Lady's-tresses (*left*).

3 *Pl.* 129. **Twayblade.** (p. 139). *K* 141.
Listera ovata. ORCHIDACEAE.

insect's head and the pollinia, which are withdrawn on the retreat of the visitor, firmly attached to its head. Then the beak moves backwards to its former position, leaving no barrier to a second visitor, pushing the pollinia with which it may be decorated against the sticky stigma.

Owing to the perfection of these arrangements—which were described with considerable detail by Darwin—the insect on first visiting a Twayblade flower does not touch the explosive beak until it has finished its drink: then, on raising its head preparatory to flight, contact is made, the pollinia are attached securely, and the insect goes off with the materials for cross-fertilizing another flower. Owing to the strength of the cement, the pollinia remain attached; but the weakness of the threads permits the pollen-grains to be picked off on contact with the stigma.

The seed-capsule is quite short and relatively thick.

Lesser Twayblade (*Listera cordata*).

THE small size of this Twayblade might lead the rambler to suppose that it is merely a starved form of the common species, impoverished by its situation and surroundings; for it is a plant of the uplands, found in moist spots in the mountain woods and among the heather of the northern moors. An inhabitant chiefly of Scotland and the North of England, it is rare in Ireland. Usually only from three to six inches high, occasionally it is taller; the slight, smooth, brownish stem is angled, instead of being rounded as in the common species. The leaves are reduced to a length of an inch or less, and are heart-shaped with acute tips; of thin texture. The minute, brownish-green flowers are combined in a short, loose spray, which may be found from July to September.

The structure of the flowers follows pretty closely that of the larger species, and the behaviour of the essential organs towards insect visitors is very similar. One small difference may be noted in the lip : at the base, in the Twayblade, there are indications of a pair of lateral lobes which are developed in the Lesser Twayblade, and curve upward, compelling visitors to go straight to the beak. The terminal divisions of the lip are relatively narrower also.

Bird's-Nest Orchis (*Neottia nidus-avis*).

In spite of its large size and robustness, the Bird's-nest Orchis is by no means a conspicuous plant ; and its uniform yellow-brown coloration is far from being attractive. It is found in shady woods, principally those of beech where there is a deep carpet of decaying leaves ; it is widely distributed throughout the country, with the exception of the north-west of Scotland. It cannot be considered a common plant, though in some localities, in certain seasons, it may be abundant. Formerly thought to be a parasite upon the roots of beech, existing like the superficially similar Broomrapes, it is known now to be a saprophyte, owing its existence to the co-operation of the friendly root-fungi (*Mycorrhiza*), which feed it with nutriment obtained by breaking down the dead leaves.

The full-grown plant is a foot or a foot and a half high, consisting of a stout stem ending in a dense or loose truss of from forty to fifty large flowers, also yellow-brown, which may be found from the latter half of May to the middle of July. At the base of the stem underground, the rootstock will be found in the shape of a spreading mass of thick, fleshy fibres, whose appearance suggested the name of Bird's-nest. These are not roots, for on occasion buds are produced at their extremities from which young plants

3 *Pl.* 130. **Tubers of Irish Lady's-tresses:** *K* 142.
Rydberg's L-t. (p. 137). Cork L-t. (p. 135).

3 *Pl.* 131. **Bird's-nest Orchis.** (p. 142) A 143.
Neottia nidus-avis. ORCHIDACEAE.

are developed. There is not a single leaf or other green part. Where leaves should be are long brown scales that clasp the stem (Plates 131, 132, 133).

The flowers are half an inch long, from the tip of the upper sepal to the end of the lip; and their structure follows close upon the lines of those of the Twayblade. The broad lip has a nectar-holding basin at its base, and its tip is divided into two large, widely spreading lobes with deckled edges. Some small, rough points on the crest of the beak are said by Darwin to be particularly sensitive, a touch causing the expulsion of the viscid fluid which cements the pollinia to the insect. The pollen-masses are even more weakly tied together than in Twayblade; and some of the grains are left behind, to cling to thrips and other small creeping insects, by which they are left on the stigma—thereby ensuring self-fertilization, should it happen that pollinia are not brought in from other flowers. By one method or the other, a great number of seed-capsules are produced on each stem.

Owing apparently to the leaves being reduced to scales, John Ray refers to this plant as the Mishapen Orchis or Bird's Nest.

Broad-Leaved Helleborine (*Epipactis latifolia*).

THE British species of *Epipactis* were regarded by Bentham and by Hooker as being two only, the latter author separating the present species into three sub-species. More recently these three have been made into four and their status has been raised to that of distinct species, their characters having been established owing to the critical studies made by the Drs. Stephenson and Col. Godfery. The average Orchid-amateur, however, will probably find it less worrying to follow Hooker and to regard these still

as sub-species or species in the making, the differences not being of the pronounced kind that distinguish, say, *Orchis mascula* from *Orchis morio.*

The Broad-leaved Helleborine may be described as a woodland Orchid, though it is found often in the open, but seldom far from trees, showing a decided preference for the companionship of the beech. It occurs in England, Scotland and Ireland, flowering from July to September. Its usual height is between two and three feet, but examples may be found that are no more than ten inches, and others that exceed four feet. In this genus there are no tubers, the rootstock taking the form of a tassel-like bunch of hairy fleshy cylinders springing from the base of the stem, beside which will be seen the white bud for next year's growth. The lowest leaf is quite small in comparison with the next three leaves, which give to the plant its English and Latin names; from this point they become progressively narrower up the round, downy stem, which they clasp and then spread outwards. The bracts below the flowers are slender and taper to a long point, and the lower ones are longer than the ovary (Plate 134).

The truss of flowers in which the stem terminates is of considerable length, and though in young plants there may be only a dozen blossoms, in mature plants there are from thirty to a hundred. The ovary is pear-shaped, thickest at the top, rough with scattered fleshy points and supported on a curved and twisted stalk; the ovary itself is not twisted.

Sepals and petals are similar in size, and all spread, though at first not widely. The sepals are dull green, variably tinged with purple; the petals edged with purple and more or less suffused with some tint of purple or rose. The lip is peculiar, in that it is divided into two distinct portions with a connecting hinge: the basal part has its

white sides turned up strongly to enclose a deep basin with a dark purple floor covered with free nectar; the purple terminal lobe or epichile is heart-shaped, broader than long, the little point turned under. There are bosses on either side of the base of the epichile, and the smooth or wrinkled condition of these elevations has been made the material for varietal distinction by some authors, but it appears to be inconstant and unreliable. So also it is stated that the epichile has a central ridge; but this cannot be seen always.

The sexual parts agree pretty closely in their arrangement with those of the Twayblade and Bird's-nest. There is a large anther attached to the top of the column and curved forwards over the stigma and the beak. The released, cream-coloured pollinia are stalkless, and lie upon the back of the white stigma, where they remain unless removed by an insect breaking the cap of the large, protuberant beak and setting free the viscid matter it contains. This cements the pollinia to the insect's head.

Bees and their kind, flies also, appear not to be attracted by the copious nectar that is so easily accessible in this flower. Apparently, the work of cross-pollination is performed entirely by wasps; and not until they have taken their fill of the nectar are they laden with the pollinia. Having reached the end of the lip-basin, contact is made by the head, raised in preparation for departure, striking the beak: the attachment of the pollinia follows instantly. Darwin, as the result of his observations, expressed the opinion that, if wasps were to become extinct in any district, the Broad-leaved Helleborine would probably cease to exist there also. That these insects do their work well, we can testify, from the examination of long spikes and finding the pollinia removed from every flower.

Purple Helleborine (*Epipactis atropurpurea*)

RELATIVELY small compared with the Broad-leaved Helleborine, the Purple Helleborine is also much rarer: for, though it is found in all three kingdoms, it occurs in only a few localities of each, and is restricted to the limestone formations. It is the plant that Ray called the Bastard Hellebore with a blackish flower.

There is only one stem, which varies in height from six to eighteen inches; and it flowers in July and August. The leaves are all small, the lowest oval-oblong, pointed, usually purple on the underside; the upper leaves lance-shaped. The bracts are smaller than the smallest leaf, but the lower ones exceed the flowers in length.

The small flowers vary in colour from dark yellow to rich dull purple, or purple and green; the ovary is roughly downy. The lilac terminal segment of the lip is oval, broader than long, with a small point, and, usually, there are three rugged elevations which often coalesce.

Green-Flowered Helleborine (*Epipactis viridiflora*).

ALTHOUGH in general appearance very like the Broad-leaved Helleborine, the present species differs from it in many respects: especially is this the case when the sexual parts are compared. Its distribution is restricted to England; and it may be found flowering about two weeks earlier than the Broad-leaved species. The lowest leaves are less broad here, and those above them have a tendency to form two rows up the stem. The rootstock descends rather deeply, and emits fleshy fibres at different levels.

The flowers are smaller, yellowish-green, seldom with any tinge of purple or brown. The terminal segment of

3 *Pl.* 132. **Bird's-nest Orchis.** (p. 142). *L* 146.
Neottia nidus-avis. ORCHIDACEAE.

3 *Pl.* 133. Roots of Bird's-nest Orchis, (p. 142). *L* 147.
Neottia nidus-avis. ORCHIDACEAE.

the lip is triangular, with a long point, extended in woodland plants but turned under in sand-dune forms; the bosses not much developed. The ovary, which is more spindle-shaped, is smoother. The anther is stalked and slender, and the small beak disappears by absorption soon after the flower opens, so that the loosely compacted pollinia, becoming friable, drop pollen upon the stigma and so effect self-fertilization. According to Müller, this is brought about also by the lower grains of the pollen-mass emitting tubes which penetrate the stigma. The fact that the hollowed base of the lip still contains a little nectar, indicates that the flower was formerly fertilized by insect aid; and, in all probability, it still gets an occasional cross in this way.

There are several named varieties of this plant.

Violet Helleborine (*Epipactis purpurata*).

LIKE the green-flowered species, this Helleborine appears to be restricted in its distribution to England, and to be by no means common there. It is a woodland plant; and it may be recognized, as a rule, by the purplish tinge suffusing its stems, leaves and downy ovaries. There is, also, a marked disposition to a tufted growth; for, whilst the younger plants may have only a single stem or two stems, old-established examples may have twenty or more. The leaves are smaller than those of *latifolia*, and less firm in texture: the lower leaves oval-lance-shaped, the upper ones narrowing progressively until they become bract-like. The actual bracts are very long and slender, especially those of the lower flowers. The flowering season extends from late July to early September (Plate 135).

The sepals are green; the petals whitish-green, tinged with pink. The basal half of the lip, also, is whitish-green;

but the terminal segment is white with a tinge of pink. This part is heart-shaped, broader than long, and has a sharp point: there is a small central boss, with larger, wrinkled side elevations. The anther is not stalked, and only its empty tip projects over the upper edge of the stigma. The beak is large and well-developed: when ruptured by retiring visitors, it attaches itself to the pollinia just below their apex. The pollinia are carried off by wasps, the pollinating agents. The ripe, grey-green capsule is three-angled, thickest a little below the top.

Marsh Helleborine (*Epipactis palustris*).

DISTRIBUTED throughout England and the southern half of Scotland (less widely in Ireland, where it is rare), the Marsh Helleborine is by no means a common plant, though it may appear in numbers in its chosen localities, which are often in the neighbourhood of the coast. Marshy, boggy and wet places should be explored for it, for it may be hidden from cursory inspection by the jungle of Reeds and Hemp-agrimony (Plates 140, 141).

Although much smaller than the woodland species, it is a very sturdy plant, with a solid slender stem from a foot to eighteen inches high: round and smooth below, but each internode marked with a ridge which is a continuation downwards of the prominent midrib of the leaf above; the upper part of the stem is squarish and slightly downy.

The large lower leaves are lance-shaped, tapering from a broad rounded base which clasps the stem. Below this is a sheath which wraps the stem closely. The veins are strongly marked; and on the underside three of them on each side of the midrib form prominent ribs. The bracts are large and green, but shorter than the drooping flowers. The latter are comparatively few, loosely disposed but all

3 *Pl.* 134. **Broad-leaved Helleborine** (p. 143). *L* 148.
Epipactis latifolia. ORCHIDACEAE.

3 *P.*. 135. **Violet Helleborine.** (p. 147). *L* 149

Epipactis purpurata. ORCHIDACEAE.

hanging to one side of the spike. The flower-spike photographed was better furnished than many : it was four inches long, with eighteen blossoms.

The long, downy ovary is narrowly pear-shaped, purplish-green in colour. The sepals are pale dull green and ridged on the outer surface ; the inside purplish. The petals are white, tinged faintly with purple which may be in streaks. The hinged epichile of the lip is roundish with toothed margins, the ridges of the crest covered partly with yellow hairs ; the concave basal half has five curved purple lines on each side of the yellow channel. The large, globular beak projects slightly in front of the stigma, which has large lobes at the sides. The flowers may be found in July and August.

The attachment of the epichile to the hollowed base of the lip is by a very narrow hinge, which is sufficiently elastic to keep the epichile raised, partially closing the flower, until the slight weight of bee or fly depresses the epichile and allows the insect to advance along the nectar-coated hollow. The weight removed, the epichile resumes its former position and its ridges hinder the free exit of the visitor which has to back out, scraping first the stigma and then the beak, whose viscid cap is rubbed off and attached to the insect, carrying with it some threads of the pollinia and attached pollen-masses. The process was made clear by Charles Darwin many years ago ; and although the action of the epichile prevents our witnessing what actually occurs when an insect enters, an examination of the fresh flower will enable us to understand the whole business. The honey-bee, which appears to be the chief agent in pollinating this species, stands on the epichile and keeps it depressed whilst it sucks up the nectar from the basal cup ; but as it is flying off the action of the epichile causes it to touch against and rupture the beak.

Solitary wasps, various flies and small beetles also assist in the work of pollination ; and though some of these are too small to remove the pollinia, their bodies and limbs pick up stray grains of pollen which may thus get to the stigma of another flower. A visitor lands on the addendum to the lip, and its slight weight is quite sufficient to depress the platform and secure easy admission to the nectar-basin. The weight removed, the lip closes again ; so that the bee or large fly, on retiring, has to push against the tender beak, which breaks off, attaching itself to the insect and carrying the pollinium with it.

White Helleborine (*Cephalanthera latifolia*).

Though accounted one of our rarer Orchids, in the beech-woods on the chalkhills of southern England, the White Helleborine is distinctly plentiful ; but as we go farther north it becomes less frequent, and Cumberland is the limit of its range. Taking the country as a whole, therefore, we must class the species as rare. Though not very tall, it is a conspicuous plant, owing to its creamy-white flowers, which are few in number and always well apart ; and the fresh green leaves show distinctly against the bare carpet of dead beech-leaves from which the plant springs. The older plants are more or less tufted, several stems rising from the same creeping rootstock—there are no tubers, and none of the leaves are radical. They are all stem-leaves, from one to six inches long, arranged in two rows right up the stem, the upper ones lance-shaped with long points : all more or less clasping the stem and closely ribbed. The lowest leaf of all remains wrapped closely around the base of the stem ; the next above it is short and oval. The large bracts are much longer than the smooth, slightly twisted ovaries. The plant is usually a foot to a foot and a half

3 *Pl.* 136. **Narrow-leaved Helleborine** (p. 152). *L* 150.
Cephalanthera longifolia. ORCHIDACEAE.

3 *H.* 137. **Coral-root Orchis and tubers.** (p. 156). *L* 151.

Corallorrhiza trifida. ORCHIDACEAE.

high. It shows a distinct preference for growth in the shade of the beech branches, but a few plants will be found in the open, though always in the immediate vicinity of the beech.

The flowers, which may be found in the latter half of May and throughout June, are borne nearly upright on the undulating spike, which may be quite zig-zag ; and they have the appearance of being never more than half-open. Only the sepals separate : the petals remaining connected by their tips and curved over the column and the hollowed basal lobe of the lip. There is a constriction of the lip in the middle, dividing it into two portions, whereof that at the extremity is roundish and yellow, the colour contributed mainly by five hairy ridges, of which the central three are most prominent. The opening of the flower consists in the turning outwards of this yellow lobe, which turns up again and closes the flower after fertilization.

The inner arrangements of the flower are somewhat peculiar, and should be examined closely. There is no beak, the large stigma being extended upwards in front of the lower third of the anther ; and owing to the latter having a spring hinge the pollen-masses rest against the edge of the stigma. The pollen-grains are only loosely connected by slight threads, and form no stalk. Darwin speaks of them as " pillars of pollen " ; he found that after being ejected from the anther-cells the lower grains emitted their tubes, which penetrated the back of the stigma, and so effected partial self-fertilization. In spite of this and the fact that no nectar is produced, he thought that the flowers must be visited by insects, for he found the ridges of the lip gnawed and pollen separated from the pillars attached to the face of the stigma. He came to the conclusion that the White Helleborine is constantly self-fertilized, partly by insects getting dusted with pollen as they crawl in and out of the

flower. Pollen so obtained, he realized, might be carried to other plants, and so cross-fertilize them ; but he had no evidence upon this point. The fact that nearly every flower produces a seed-capsule, as in the Bee Orchis, shows that self-fertilization is the rule (Plates 142, 143).

Recently, Col. Godfery has disturbed a Humble-bee that was visiting one of the flowers, and has found flowers from which the pollinia had been removed bodily. In consequence, he made experiments which showed that a bee, crawling up the stigma, would get itself smeared sufficiently with the viscid secretion to detach and carry off on its body one or both of the pollinia. It appears, therefore, that though as a rule self-fertilization takes place, there is an occasional cross, for which the mechanism remains intact, though it is not so perfect as in most other orchids.

A somewhat puzzling example of this Orchid, found on the Surrey chalk range, had a stout stem thirteen inches high, with the upper leaves much larger than the lower, and very broad. The normal flower spike was absent, and in its place was a dense tuft of about sixty long bracts which resembled closely the galls of *Cecidomyia taxi* that are so abundant on the Yew. In the axil of every bract was a minute flower-bud ; but it did not appear to be probable that these would ever attain to the opening stage. We suspect that this was really a gall due to the growing point of the stem having been attacked by a minute gall-fly.

Narrow-leaved Helleborine (*Cephalanthera longifolia*).

Though wider in its distribution than the White Heleborine, being found in the three kingdoms, the Narrow-leaved Helleborine is much more rare. It, also, is a beech-wood plant, and the stature of the two species is much the same, but the stems here are more liable to be solitary. In

the matters of foliage and flowers, however, there is considerable difference. The straight-sided leaves are not only narrower, but are much longer; this is specially noticeable in the upper part of the plant. The flowers, too, are restricted to the extremity of the stem, and are more slender in form and whiter in colour; the bracts—with the exception of that of the lowest flower—are very much shorter than the ovaries, and those of the upper flowers are minute. The nearly upright flowers appear in May and June.

The arrangements of the flowers are very similar to those of the previous species, but the sepals have their tips more pointed. The mechanism is much the same; but Col. Godfery, as the result of observations made in several parts of France, where this plant is more plentiful than with us, came to the conclusion that the flowers are cross-fertilized by insects habitually, as indicated by Delpino previously. Godfery was unable to discover the particular insect that carries out the work, but on dissecting the flowers he found evidence of their industry: from many the pollinia had been removed, but in one where both were in place he found a third pollinium with portions of a fourth adhering to the stigma. This certainly established the fact of cross-pollination, and was presumptive evidence that it had been effected by insect agency. Godfery found that in this species the pollinia are not attached to the edge of the stigma by penetrating tubes, and that, consequently, they could be removed whole by an insect that had got smeared with viscid matter by walking up the stigma: the pollinia being kept well in the way by the pressure of the elastic-hinged anther.

It is desirable that any reader who may come across this Orchid—and, indeed, any other species—should keep the plant under observation before gathering the flowers, if that should be his intention. Take note of the insect

visitors, if any: their behaviour in the flower: whether adorned with pollinia either entering or leaving: and if uncertain as to the species of insect, to capture it for identification. There is still need for further evidence on such points, even where our commonest Orchids are concerned (Plate 136).

Red Helleborine (*Cephalanthera rubra*).

THIS is the rarest of our three species of *Cephalanthera*, its distribution being restricted to limestone areas in Gloucestershire and Somerset, where it is found in woods and copses, flowering in June and July. The slender, purplish stem may be only six inches or as much as a foot and half high. The sharp-pointed leaves are lance-shaped. The beautiful flowers are even less-open than those of the other species; the pointed sepals and petals are rosy-purple; and the lip is white with yellow lines and edged with purple, the terminal lobe a slender oval. The bracts are here longer than the ovaries, which are coated with glandular down. The mechanism for fertilization is similar to that of the last species. Owing to the rarity of the plant, few observations of it in the growing state appear to have been made; but on two occasions, Col. Godfery has seen the gathered flower-spikes visited by a red Humble-bee.

Owing to the absence of a beak and to the friable condition of the pollen-masses, Darwin thought it probable that the genus *Cephalanthera* represented a degradation of *Epipactis*. Godfery, however, considers that these imperfections point to the fact that it is a survival of a more primitive method of cross-pollination in the remote period before the Orchids had evolved the beak.

3 *Pl.* 138. **Bog Orchis.** (p. 157). *L* 154.
Malaxis paludosa. ORCHIDACEAE.

3 *Pl.* 139. **Fen Orchis.** (p. 158). *L* 155.
Liparis loeselii. ORCHIDACEAE.

Leafless Orchis (*Epipogium aphyllum*).

THIS must be accounted as the rarest of all the rare British Orchids ; and even in its wider range, in Europe and Asia, it appears to be common nowhere. In the earlier half of the last century, it obtained a place in the British flora through having been once found among decaying leaves in a damp wood in Herefordshire. Years later, it turned up near Ludlow, in Shropshire ; then, for a long period it was not seen again. Within the last few years, however, it has made several appearances in Oxfordshire. It is worthy of notice that in each of these records the finder has been a lady. It is not at all improbable that it may be less rare than the few finds indicate, for the smallness of the plant, its leaflessness, its shabby and inconspicuous colouring, and its general harmony with its surroundings, may have caused it to be overlooked, time and again. Like the much larger Bird's-nest Orchis, it is a saprophyte, fed by the friendly Mycorrhiza entirely upon the remains of broken-down leaves. This explains the absence of leaves and of all green colouring.

The Leafless Orchis is a pale yellow-brown plant from three to eight inches high, springing from a few branched, fleshy root-fibres, the stem swelling above its base, wrapped by one or two sheaths that represent the absent leaves. The few (from two to six) flowers are pale yellow with short stalks and bracts of the same length. Neither stalk nor ovary is twisted, so that the three-lobed lip stands at the top of the flower. The ovary is short and stout. Sepals and petals are much alike, narrow lance-shaped with acute tips and the edges curved inwards. They spread outwards. The large, oval, middle lobe of the lip is whitish, marked in its length by four lines of raised purple dots, and curved outwards. There is a short, thick spur containing nectar.

The inner parts comprise a short column, bearing the horse-shoe-shaped stigma, above which it is dilated into two lobes as a support for the anther; there is no beak. There are two stalked pollinia.

The flowers appear in August, and give out the odour of vanilla, which attracts Humble-bees: these are, apparently, the cross-pollinating agents. In addition to the usual reproduction by means of seeds, this Orchid is able to propagate itself vegetatively: Mr. A. J. Wilmott, who has had experience of the living plant, informs the writer that buds are formed at the distal ends of the rootstock.

Coral-root Orchis (*Corallorrhiza trifida*).

In several respects similar to the Leafless Orchis, this is also rare, but not so rare, for in those districts of eastern Scotland where it is found it appears in numbers. Its only English record is for Northumberland; in Ireland it is unknown. It is a small, leafless saprophyte that inhabits boggy or wet sandy woods and copses, flowering from June to August (Plate 137).

The roots consist of thick, fleshy fibres with many short branches invested with Mycorrhiza. The slender, yellowish stem is tinged with green in its lower part; has one or two red-brown sheaths, and varies in height from four to ten inches. There are from four to twelve small, dingy flowers, appearing from June to August. Sepals and petals are much alike, olive-green, lance-shaped with acute tips; the upper sepal and petals covering over the long column, the lateral sepals spreading. The lip is oblong with two small basal lobes: white, with a few small purple tubercles. There is a very small spur, attached to the ovary. The anther terminates the column, and there are four roundish masses of waxy pollen. There is no beak.

3 *Pl.* 140 **Marsh Helleborine.** (p. 148) *L* 156.
Epipactis palustris. ORCHIDACEAE.

3 *Pl.* 141. **Marsh Helleborine.** (p. 148). *L* 157.
Epipactis palustris. ORCHIDACEAE.

Bog Orchis (*Malaxis paludosa*)

One distinction of the present species is that it is the smallest of the British Orchids. Apart from its rarity, it is also, probably, the most difficult to find when we are upon a known resort for it. It grows upon Sphagnum in bogs and swamps in England, Scotland and Ireland ; and this habit (shared by the next species) brings it near to the tropical Orchids that grow upon trees (*epiphytes*).

The plant springs from a small egg-shaped tuber, which, owing to its being above ground, is green. The swollen base of the stem is sheathed with white scales, in which is forming the new tuber for next year's growth. There are two or three small, thick, oval leaves near the base of the stem ; and these have their blunt tips fringed with minute bulbils which develop into young plants. The stem ranges in height from two to five inches, ending in the spike of minute, yellow-green flowers, which appear from July to September (Plate 138).

We have called attention already to the fact that, in most of the Orchids, the natural position of the organs has been reversed by the expedient of twisting either the ovary or its footstalk, so that the lip, which is properly the upper petal enlarged, shall serve as an alighting platform for insect-visitors. In Bog Orchis we find that the flower has reverted to the original position ; but it has done this, not by straightening out the twist, but by giving an additional turn to the screw. This appears to indicate that its ancestors had twisted ovaries, and that it was easier for it to go forward on the same lines than to revert to the straight-ovaried condition of the original Orchids. Unless this change of position is borne in mind when looking at the flower, the enlarged odd sepal, now occupying the lowest

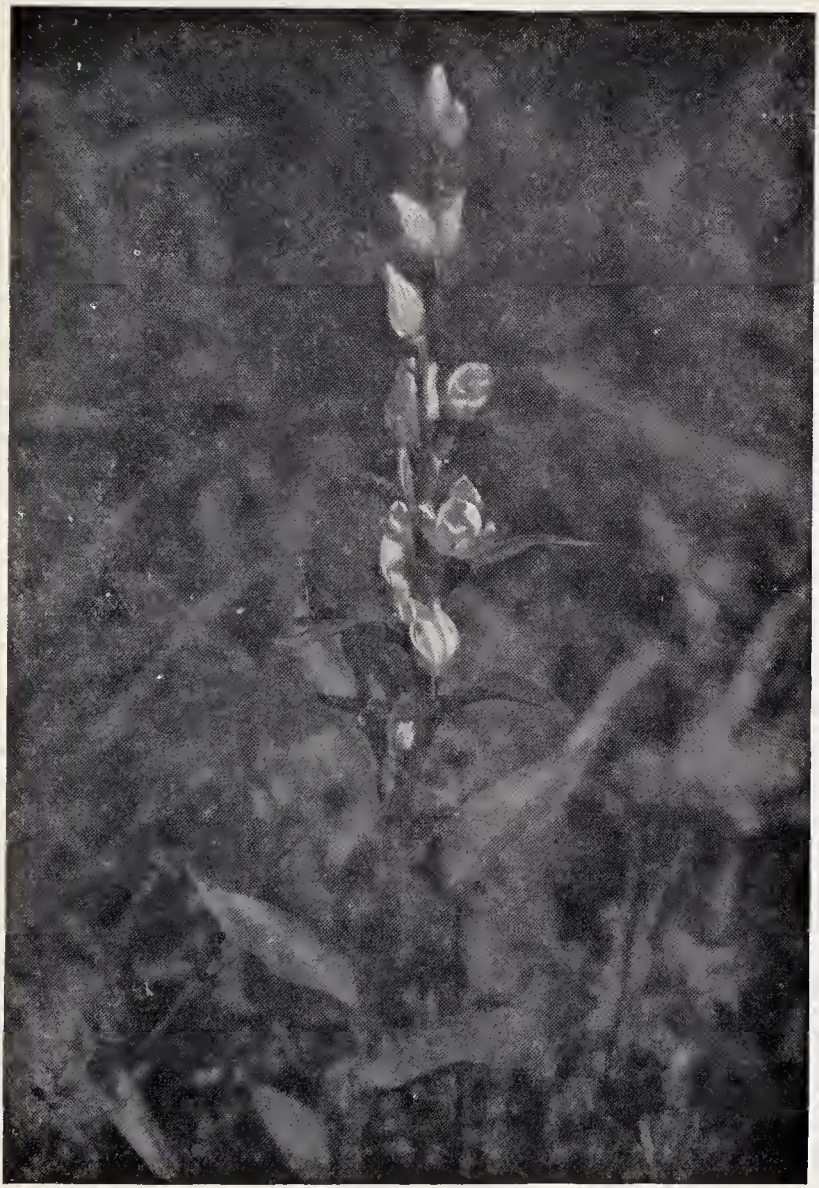
place, may be taken for the lip. The real lip is here smaller than the sepals, and forms a hood over the column, which is clasped by its base.

The front of the column bears the large beak—which is not protuberant—and below the beak there is a transverse fold forming a pocket, which is the stigma. Behind the beak, stands the anther, with its pollen-masses divided into four thin plates, broad below and narrow above. The anther shrivels away and leaves the pollinia hanging with their points projecting beyond the crest of the beak, to which they are caught by a drop of gum. The flowers are very attractive to insects: when one has pushed into the narrow space between the lip and the beak, on withdrawing its head when departing, the pollinia become attached and are carried off. Their position is now such that, when the insect enters another flower, the pollinia are pushed into the stigmatic pocket.

Fen Orchis (*Liparis loeselii*).

RESEMBLING the Bog Orchis in its habit of growing with its tuber on the surface of spongy bogs, and in its small yellow-green flowers having a very similar arrangement of the sexual organs, the Fen Orchis differs in the greater length of the triangular stem, the larger size of the flower, the position of the lip, and the much larger leaves. The range of the plant in its typical form is restricted to the fenny districts of Norfolk, Suffolk and Cambridgeshire, from which it has been all but exterminated by the drainage of its haunts; strangely, in recent years, a smaller form (the var. *ovata*), with broader leaves, has been found on moist sand-dunes on the opposite side of the island—in Glamorganshire and Carmarthenshire (Plate 139).

The Fen Orchis springs from an egg-shaped tuber, and the



3 Pl. 142. White Helleborine. (p. 150). *L* 158.
Cephalanthera latifolia. ORCHIDACEAE.

3 *Pl.* 143. **White Helleborine.** (p. 150). *L* 159.
Cephalanthera latifolia. ORCHIDACEAE.

stem, swollen at the base, is sheathed with white scales, among which will be found the tuber for the next year's growth. The two or three leaves, from an inch to three inches long, are oblong-lance-shaped, pointed, smooth and strongly keeled. The erect, yellow flowers, from six to fourteen in number, form a loose spike, which will be found in June or July ; the footstalk is twisted, but the lip keeps the upper position. Each flower is half an inch long, with spreading, lance-shaped sepals and narrower petals. The oval lip is larger than the sepals or petals, and is turned upwards. The sexual organs differ little from those of the Bog Orchis ; but the depressed stigma is smaller. It is probable that their action is the same as in the last species ; but observations on this point are needed.

Lady's Slipper Orchis (*Cypripedium calceolus*).

Last on our list of British Orchids comes the beautiful Lady's Slipper, which might almost excuse us for using the well-worn *cliché* and adding " by no means least." The reason for its appearance at the end of the series is, that it belongs to a distinct section of the Orchids, characterized by the development of two anthers instead of the one that suffices in all our other native species. Regretfully, we must add that it is another of the rather large proportion of our species that have to be marked as " very rare." Like some others, its beauty endangers its very existence. Always restricted to dense woods in the limestone districts of Durham, Lancashire and Yorkshire, it has suffered to the verge of extinction from the practice of everyone finding it lifting it for removal to their gardens, where, as a rule, the existence of Orchids is very brief. That this is not entirely a modern practice is shown by the lament of a botanist of more than a hundred years ago that he had " searched for

it in vain in Helk's Wood, one of Ray's localities, a gardener of Ingleby having eradicated every plant."

Lady's Slipper has a height of six to eighteen inches, and springs from a creeping rootstock. There are two or three large, oblong leaves, ribbed, and with a pointed tip; the bracts are very large and leaf-like. As a rule there is only a single flower, but sometimes there are two flowers. These make up for their paucity in number by their large size: the dark red-brown sepals and petals being an inch to an inch and a half long, and spreading widely, and the shoe-shaped lip is of similar length. The petals are narrower than the sepals, and the lateral sepals are joined together and form a broad expansion below the lip.

The pale-yellow lip is the most remarkable we have encountered hitherto. The authorities content themselves by setting it down as "inflated," which is certainly an inadequate description for those who have not seen it. The margins of the lip are all turned up so that they arch over to form an oval bag, with a slit half-way along the upper side whose edges are turned in and polished on their lower face. In this matter, there is a resemblance to the scheme of some domestic beetle-traps—entrance being made easy, and exit by the same route difficult or impossible. When he comes to a consideration of the other parts of the flower—the column, the anthers and stigma—the novice will experience a little difficulty in making them agree with the descriptions of the other species (see Frontispiece).

Theoretically, the Orchid-flower has all its parts in threes: three sepals, three petals, three stamens and three styles with their stigmas, the stamens and styles being united to form the column. Now, in all the genera considered previously, only one stamen is developed, and one of the stigmas is converted into the beak, the other two in many cases becoming confluent and appearing as one. In *Cypripedium*

this is changed somewhat: the stamen that was effective and produced two pollinia is here changed into a barren, leaf-like staminode, whilst the two that were abortive are now developed, and produce loose pollen-grains instead of pollinia. There is no beak, all three stigmas functioning as such and confluent. The upper part of the column curves forwards and nearly closes the opening of the lip near its base with the staminode. Below this the stigma protrudes slightly; and on each side of the staminode is an anther whose loose pollen-grains are mixed with an adhesive fluid, which makes it impossible for it to get on the stigma without the aid of some carrying agent. Moreover, the stigma itself lacks the adhesive quality that we have found in the other genera.

The flowers are found in May and June; and they give off a pleasant odour which has been compared with the fragrance of orange-blossom. It attracts the attentions of short-tongued bees of the genus *Andrena*, though no nectar is offered for their refreshment. There are glandular hairs on the inner surface of the slipper, and some satisfaction may be derived from the gnawing of these. A bee, having entered through the slit in the top of the bag, finds it impossible to make an exit by the same door, owing to the slippery, inturned edges. Two small windows beside the anthers let in light, and the bee would naturally make for one of these. To reach either, the bee must pass over the stigma; and if she has recently been in another Slipper, some of the pollen she has brought from it will adhere to the stigma. To pass out through one of the windows she must push against an anther and get smeared with the sticky pollen, which will be left on the stigma when she visits another flower.

FAMILY CHARACTERS OF BRITISH PLANTS

Described in this volume

Buttercup Family (*Ranunculaceæ*).

The family characters will be found on page 149 of the First Series. The additional genera now included are: *Thalictrum* (p. 1), *Adonis* (p. 3), *Myosurus* (p. 4), and *Trollius* (p. 7).

Poppy Family (*Papaveraceæ*).

For family characters see First Series, page 150. The additional genus represented is *Meconopsis* (p. 8).

Fumitory Family (*Fumariaceæ*).

The family characters are given in First Series, page 151. The only other British genus, *Corydalis*, is now added (p. 9).

Crosswort or Cabbage Family (*Cruciferæ*).

The family characters will be found in the First Series, page 152. To the ten genera there indicated are now added eight others. These are: *Nasturtium* (p. 11), *Dentaria* (p. 13), *Draba* (p. 14), *Cochlearia* (p. 16), *Lepidium* (p. 17), *Subularia* (p. 19), *Cakile* (p. 20), and *Crambe* (p. 20).

Pink Family (*Caryophyllaceæ*).

To this family, described in First Series, page 154, are now added three genera: *Sagina* (p. 21), *Honkeneja* (p. 23) and *Spergularia* (p. 24).

Mallow Family (*Malvaceæ*).

To this large family, poorly represented in Britain (see First Series, page 156), are now added the remaining two native genera: *Althæa* (p. 26) and *Lavatera* (p. 27).

Rose Family (*Rosaceæ*).

This extensive and important family, described on page 158 of the First Series, where reference is made to nine illustrative genera represented in that volume, receives an addition in *Alchemilla* (p. 28).

Loosestrife Family (*Lythraceæ*).

Described in First Series, page 160, and illustrated by one of the only two British genera; the remaining genus *Peplis* is now added (p. 30).

Stonecrop Family (*Crassulaceæ*).

Of the three British genera of this family, whose characters were given in First Series, page 159, one genus has been described, and to this is now added *Cotyledon* (p. 30).

Carrot Family (*Umbelliferæ*).

The characters of this large and important family were given at considerable length in First Series, page 161, and no fewer than fourteen of the three dozen British genera were used in illustration. To these are now added the five genera following: *Ægopodium* (p. 31), *Angelica* (p. 32), *Pastinaca* (p. 33), *Torilis* (p. 34), and *Smyrnium* (p. 35).

Mistletoe Family (*Loranthaceæ*).

Evergreen shrubs, all more or less addicted to parasitism. Frequently the stems are jointed, the entire leathery leaves

are usually in pairs and have no stipules. They are attached to their hosts by means of modified roots which penetrate the tissues. The flowers are usually in groups of three, but in some exotic species they form spikes. The two sexes may be in the same flower or separate. The flower consists of a perianth of four to eight parts, which may unite to form a tube with thick lobes at the mouth. To each lobe there is attached a stamen, and the anther opens by slits or pores. The ovary is sunk into the receptacle, one-celled, and the style is either simple or absent. This develops into a false berry containing a single seed, which is surrounded by a layer of viscin which causes its ready adhesion to the bark of trees.

The only British genus is *Viscum*, described on page 36.

Bedstraw Family (*Rubiaceæ*).

The tribe Galieæ, to which all the British genera and species of this enormous family belong, is described in the First Series, page 162. To the illustrative genera is now added *Rubia* (p. 38).

Daisy Family (*Compositæ*).

The general characters of this, the largest and most widespread of all the families of flowering plants, will be found in the First Series, page 164, with references to twenty genera illustrated in that volume. In the Second Series (see p. 145) nine other genera were added, and these are now supplemented by six others, making thirty-five in all.

The genera illustrated are : *Aster* (p. 39), *Solidago* (p. 40), *Bidens* (p. 41), *Serratula* (p. 42), *Silybum* (p. 45), *Crepis* (p. 46), with additional species of *Cnicus* (p. 43), and *Hieracium* (p. 49).

Bellflower Family (*Campanulaceæ*).

The family characters will be found in the Second Series, page 146. To the illustrative genera there named are now added two others : *Phyteuma* (p. 50) and *Legousia* (p. 51.)

Heathwort Family (*Ericaceæ*).

The family characters are given in the Second Series, page 146. An additional genus, *Monotropa*, is now described (p. 52), though, as mentioned in the text, this is by some authorities regarded as the type of a separate family—Monotropeæ.

Olive Family (*Oleaceæ*).

Shrubs and trees, with opposite branches and leaves, the latter without stipules and either simple or broken up into pinnate leaflets. The flowers have a four-lobed calyx and a four-parted corolla, though in Ash both are entirely lacking (see *Wayside and Woodland Trees*, page 46). There are only two stamens ; the two-celled ovary may or may not have a simple style. The sexes may be in one flower or separate. The ovary develops into a berry or a dry fruit. The family gets its name from including the well-known oil-yielding Olive of the Mediterranean Region. Illustrative genus : *Ligustrum* (p. 54).

Gentian Family (*Gentianaceæ*).

The general characters of this beautiful family will be found in the Second Series, page 147 ; and to the five genera described in that volume is now added *Cicendia* (p. 55).

Nightshade Family (*Solanaceæ*).

This large and important family—it includes the Potato, the Tomato and Tobacco—is represented but meagrely in

Britain. Its characters are given in the Second Series, page 148; *Hyoscyamus*, now added (p. 56), completes the representation of the native species.

Figwort Family (*Scrophulariaceæ*).

Another extensive family, with a larger representation in this country, has its general characters set forth in the Second Series, page 149. To the ten genera described previously is now added the genus *Antirrhinum* (p. 58).

Mint Family (*Labiatæ*).

Equally numerous in species, though with fewer genera, this useful family is well represented in Britain. Its characters will be found in the Second Series, page 150. Fourteen genera are there enumerated as examples, and to these are now added *Ballota* (p. 59) and *Marrubium* (p. 60).

Primwort Family (*Primulaceæ*).

The characters of this comparatively small family are given in the Second Series, page 147, and in the same volume five out of the eight or nine native genera are described and illustrated. In the present volume two others are included: *Trientalis* (p. 60) and *Samolus* (p. 61).

Plantain Family (*Plantaginaceæ*).

The characters of this small family are given in the Second Series, page 149. There are only two native genera, of which the typical *Plantago* has been described previously, and *Littorella* will be found in the present volume, page 62.

Goosefoot Family (*Chenopodiaceæ*).

The characters of this popularly unattractive family will be found in the Second Series, page 151. The typical genus

was described in illustration of the seven native genera, and that representation is now strengthened by the inclusion of four other genera: *Suæda* (p. 64), *Salicornia* (p. 65), *Atriplex* (p. 67), and *Obione* (p. 68).

Buckwheat Family (*Polygonaceæ*).

The family characters are stated on page 151 of the Second Series. There are only three British genera. The typical genus *Polygonum* was described, to which is now added *Rumex* (p. 69).

Orchid Family (*Orchidaceæ*).

The family characters were set out at some length in the Second Series, page 153, with references to brief descriptions of seven genera; but in the present volume the family has been given more adequate treatment. The characteristic features and habits of the group have been dealt with in the chapter "What are Orchids?" (page 73), and an account has been given, not only of all the British genera, but of every native species. There are forty-seven of these, and they are grouped in five tribes and eighteen genera, as under:

OPHRYDINEÆ: *Orchis* (p. 83), *Gymnadenia* (p. 106), *Aceras* (p. 108), *Neotinea* (p. 110), *Habenaria* (p. 111), *Ophrys* (p. 117), *Herminium* (p. 126).

NEOTTIDEÆ: *Goodyera* (p. 128), *Spiranthes* (p. 130), *Listera* (p. 139), *Neottia* (p. 142), *Epipactis* (p. 143), *Cephalanthera* (p. 150).

ARETHUSEÆ: *Epipogium* (p. 155).

MALAXIDEÆ: *Corallorrhiza* (p. 156), *Malaxis* (p. 157), *Liparis* (p. 158).

CYPRIPEDILEÆ: *Cypripedium* (p. 159).

CLASSIFIED INDEX

TO

NATURAL ORDERS, GENERA AND SPECIES

Described in this volume

Order **Ranunculaceæ.**

THALICTRUM alpinum, 3; flavum, 1, *Plate* 2; majus, 2; minus, 2
ADONIS annua, 3, *Plate* 4
MYOSURUS minimus, 4, *Plate* 3
RANUNCULUS flammula, 5, *Plate* 5; lingua, 6; ophioglossifolius, 6; reptans, 6
TROLLIUS europæus, 7, *Plate* 6

Order **Papaveraceæ.**

MECONOPSIS cambrica, 8, *Plate* 8

Order **Fumariaceæ.**

CORYDALIS bulbosa, 11; claviculata, 9, *Plate* 7; lutea, 10

Order **Cruciferæ.**

NASTURTIUM officinale, 11, *Plates* 10, 11; palustre, 13; sylvestre, 12
DENTARIA bulbifera, 13, *Plates* 12, 13
DRABA aizoides, 15; incana, 15; rupestris, 15; verna, 14, *Plate* 9
COCHLEARIA alpina, 16; anglica, 17; danica, 16; groenlandica, 17; officinalis, 16. *Plate* 15
LEPIDIUM campestre, 17, *Plate* 14; heterophyllum. 18; latifolium, 18; ruderale, 18; sativum, 19
SUBULARIA aquatica, 19, *Plate* 16
CAKILE maritima, 20, *Plate* 17
CRAMBE maritima, 20, *Plates* 18, 19, 25

Order **Caryophyllaceæ.**

SAGINA apetala, 22; maritima, 22; nodosa, 23; procumbens, 21, *Plates* 20, 21
HONKENEJA peploides, 23, *Plates* 22, 23
SPERGULARIA marginata, 25, *Plate* 24; rubra, 26; rupicola, 24, *Plate* 27; salina, 25

Order **Malvaceæ.**

ALTHÆA hirsuta, 27; officinalis, 26, *Plate* 26
LAVATERA arborea, 27, *Plate* 28

Order **Rosaceæ.**

ALCHEMILLA alpina, 29; arvensis, 29; vulgaris, 28, *Plate* 31

Order **Lythraceæ.**

PEPLIS portula, 30, *Plate* 29

Order **Crassulaceæ.**

COTYLEDON umbilicus, 30, *Plates* 32, 33

Order **Umbelliferæ.**

ÆGOPODIUM podagraria, 31, *Plate* 30
ANGELICA sylvestris, 32, *Plates* 34, 35
PASTINACA sativa, 33, *Plate* 36
TORILIS anthriscus, 34, *Plate* 37; arvensis, 35; nodosa, 35,
SMYRNIUM olusatrum, 35, *Plate* 39

Order **Loranthaceæ.**

VISCUM album, 36, *Plate* 38

Order **Rubiaceæ.**

RUBIA peregrina, 38, *Plates* 40, 41

Order **Compositæ.**

ASTER tripolium, 39, *Plate* 42
LINOSYRIS vulgaris, 39
SOLIDAGO virgaurea, 40, *Plate* 44
BIDENS cernua, 41; tripartita, 41, *Plates* 46, 47
SERRATULA tinctoria, 42, *Plates* 48, 49
CNICUS eriophorus, 43, *Plates* 43, 50, 51
SILYBUM marianum, 45, *Plates* 52, 53
CREPIS biennis, 47; capillaris, 46, *Plate* 45; fœtida, 47, *Plate* 55; mollis, 48; paludosa, 48; taraxacifolia, 46, *Plate* 54
HIERACIUM boreale, 49, *Plate* 56; pilosella, 49, *Plate* 57; umbellatum, 49

Order **Campanulaceæ.**

PHYTEUMA orbiculare, 50, *Plate* 58; spicatum, 51
LEGOUSIA hybrida, 51, *Plate* 60

Order **Ericaceæ.**

MONOTROPA hypopitys, 52, *Plates* 62, 63

Order **Oleaceæ.**

LIGUSTRUM vulgare, 54, *Plates* 64, 65

Order **Gentianaceæ.**

CICENDIA filiformis, 55, *Plates* 66, 67

Order **Solanaceæ.**

HYOSCYAMUS niger, 56, *Plates* 68, 69

Order **Scrophulariaceæ.**

ANTIRRHINU Morontium, 58, *Plates* 70, 71

Order **Labiatæ.**

BALLOTA nigra, 59, *Plates* 72, 73
MARRUBIUM vulgare, 60, *Plate* 75

Order **Primulaceæ.**

TRIENTALIS europæa, 60, *Plate* 76
SAMOLUS valerandi, 61, *Plates* 78, 79

Order **Plantaginaceæ.**

LITTORELLA lacustris, 62, *Plate* 59

Order **Chenopodiaceæ.**

SUÆDA fonticosa, 65, *Plate* 82; maritima, 64, *Plate* 83
SALICORNIA herbacea, 65, *Plate* 61; perennis, 66
ATRIPLEX arenaria, 67; hastata, 67; patula, 67, *Plate* 74
OBIONE pedunculata, 69; portulacoides, 68, *Plate* 77

Order **Polygonaceæ.**

RUMEX acetosa 72, *Plates* 86, 87; acetosella, 72; conglomeratus, 71; crispus, 70, *Plate* 80; hydrolapathum, 71, *Plate* 81; obtusifolius, 70; sanguineus, 71, *Plates* 84, 85

Order **Orchidaceæ.**

ORCHIS elodes, 93, *Plate* 101; fusca, 87; hircina, 102, *Plates* 104, 105; incarnata, 97, *Plate* 100; latifolia, 95, *Plate* 103; maculata, 77, 91, *Plates* 96, 98, 99; mascula, 84, *Plates* 90, 91; militaris, 87; morio, 83, *Plates* 88, 89; prætermissa, 96, *Plate* 109; purpurea, 85, *Plates* 92, 93; purpurella, 96; pyramidalis, 99, *Plate* 102; simia, 88, *Plate* 95; ustulata, 89, *Plates* 94, 97
GYMNADENIA albida, 108, *Plate* 120; conopea, 106, *Plates* 106, 107
ACERAS anthropophora, 108, *Plate* 108
NEOTINA intacta, 110
HABENARIA bifolia, 113, *Plate* 118; chloroleuca, 114, *Plate* 113; viridis, 111, *Plates* 110, 111, 112
OPHRYS apifera 117, *Plates* 114, 115; fuciflora, 120; insectifera, 124, *Plate* 119; sphegodes, 121, *Plates* 116, 117
HERMINIUM monorchis, 126, *Plates* 122, 123
GOODYERA repens, 128, *Plate* 124
SPIRANTHES æstivalis, 132, *Plate* 126; gemmipara, 134, *Plates* 127, 128, 130; romanzoffiana, 138; spiralis, 130, *Plates* 121, 125, 126; stricta, 136, *Plates* 128, 130
LISTERA cordata, 141; ovata, 139, *Plate* 129
NEOTTIA nidus-avis, 142, *Plates* 131, 132, 133
EPIPACTIS latifolia, 143, *Plate* 134; palustris 148, *Plates* 140, 141; purpurata, 147, *Plate* 135; viridiflora, 146
CEPHALANTHERA latifolia, 150, *Plates* 142, 143; longifolia, 152, *Plate* 136; rubra, 154
EPIPOGIUM aphyllum 155
CORALLORRHIZA trifida, 156, *Plate* 137
MALAXIS paludosa, 157, *Plate* 138
LIPARIS lœselii, 158, *Plate* 139
CYPRIPEDIUM calceolus, 159, *Frontispiece*

INDEX

ACERAS anthropophora, 108. *Plate* 108
Acicular leaf, ix
Adonis annua, 3. *Plate* 4
Ægopodium podagraria, 31. *Plate* 30
Alchemilla alpina, 29 ; *arvensis*, 29 ; *vulgaris*, 28. *Plate* 31
Alexanders, 35. *Plate* 39
Alpine Meadow-rue, 3
Althæa hirsuta, 27 ; *officinalis*, 26. *Plate* 26
Amplexicaul leaf, xi
Angelica, 32. *Plates* 34, 35
Angelica sylvestris, 32. *Plates* 34, 35
Antirrhinum orontium, 58. *Plates* 70, 71
Armillaria mellea, 79
Arrow-shaped leaf, xi
Aster tripolium, 39. *Plate* 42
Atriplex arenaria, 67 ; *hastata* 67 ; *patula*, 67. *Plate* 74
Awl-shaped leaf, ix
Awlwort, 19. *Plate* 16

BALLOTA nigra, 59. *Plates* 72, 73
Bee Orchis, 117. *Plates* 114, 115
Bidens cernua, 41 ; *tripartita* 41. *Plates* 46, 47
Bipinnate leaf, xiii
Bird's-nest Orchis, 78, 142. *Plates* 131, 132, 133
Bishop's-weed, 31. *Plate* 30
Black Horehound, 59. *Plates* 72, 73
Blade, leaf, ix
Blunt-leaved Hawk's-beard, 48
Bog Orchis, 157. *Plate* 138
Broad-leaved Marsh Orchis, 95. *Plate* 103
Brookweed, 61. *Plates* 78, 79
Burnt Orchis, 89. *Plates* 94, 97
Bur-marigold, Nodding, 41 ; Trifid, 41. *Plates* 46, 47
Butterfly Orchis, Greater, 114, *Plate* 113 ; Lesser, 113, *Plate* 118

CAKILE maritima, 20. *Plate* 17
Cauline leaves, xv
Cephalanthera latifolia, 150, *Plates* 142, 143 ; *longifolia*, 152, *Plate* 136 ; *rubra*, 154
Chickweed Wintergreen, 60. *Plate* 76
Cicendia filiformis, 55. *Plates* 66, 67
Clasping leaf, xi
Climbing Corydalis, 9. *Plate* 7
Cnicus eriophorus, 43. *Plates* 43, 50, 51
Cochlearia alpina, 16 ; *anglica*, 17 ; *danica*, 16 ; *groenlandica* 17 ; *officinalis*, 16. *Plate* 15
Compound leaf, ix, xii
Connate leaves, xi
Corallorrhiza trifida, 156. Plate 137
Cordate leaf, x
Corydalis bulbosa, 11 ; *clavicula-ta*, 9, *Plate* 7 ; *lutea*, 11

Cotyledon umbilicus, 30. *Plates* 32, 33
Crambe maritima, 20. *Plates* 18, 19, 25
Cress, Garden, 19
Crepis biennis, 47; *capillaris*, 46, *Plate* 45; *fœtida*, 47, *Plate* 55; *mollis*, 48; *paludosa*, 48; *taraxacifolia*, 46, *Plate* 54
Cucullia umbratica, 116
Cypripedium calceolus, 159. *Plate* 1 (frontispiece)

DACTYLORCHIDS, 91
Dark-winged Orchis, 85. *Plates* 92, 93
Decompound leaf, xiv
Dentaria bulbifera, 13. *Plates* 12, 13
Digitate leaf, xii
Dittander, 18
Dock, Blood-veined, 71, *Plates* 84, 85; Broad-leaved, 70; Curled, 70, *Plate* 80; Great Water, 71, *Plate* 81; Sharp, 71
Draba aizoides, 15; *incana*, 15; *muralis*, 15; *rupestris*, 15; *verna*, 14, *Plate* 9
Dwarf Marsh Orchis, 96
Dwarf, or Burnt Orchis, 89. *Plates* 94, 97

EARLY MARSH ORCHIS, 97. *Plate* 100
Early Purple Orchis, 84. *Plates* 90, 91
Early Spider Orchis, 121. *Plates* 116, 117
Elliptical leaf, x
Ensiform leaf, x
Entire leaf, xiv
Epipactis latifolia, 143, *Plate* 134; *palustris*, 148, *Plates* 140, 141; *purpurata*, 147. *Plate* 135; *viridiflora*, 146
Epipogium aphyllum, 155

FEN ORCHIS, 158. *Plate* 139
Fir-rape, 53. *Plates* 62, 63
Fly Orchis, 124. *Plate* 119
Fragrant Orchis, 106, *Plates* 106, 107; White, 108, *Plate* 120
Frog Orchis, 111. *Plates* 110, 111, 112

GASTRODIA elata, 79
Gentianella, 55. *Plates* 66, 67
Glasswort, Annual, 65. *Plate* 61; Creeping, 66
Globe-flower, 7. *Plate* 6
Goatweed, 31. *Plate* 30
Golden Rod, 40. *Plate* 44
Goldilocks, 39
Goutweed, 31. *Plate* 30
Goodyera repens, 128. *Plate* 124
Greater Butterfly Orchis, 114. *Plate* 113
Greater Meadow-rue, 2
Greater Spearwort, 6
Green Man Orchis, 108. *Plate* 108
Green-winged Orchis, 83. *Plates* 88, 89
Gymnadenia albida, 108, *Plate* 120; *conopea*, 106, *Plates* 106, 107
Gyrostachys stricta, 137. *Plates* 128, 130

HABENARIA bifolia, 113, *Plate* 118; *chloroleuca*, 114, *Plate* 113; *viridis*, 111, *Plates* 110, 111, 112
Hadena dentina, 116
Halberd-shaped leaf, xi
Halictus quadrinotatus, 104
Hand-Orchids, 91
Hastate leaf, xi
Hawk's-beard, Blunt-leaved, 48; Large Rough, 47; Marsh, 48; Small Rough, 46, *Plate* 54; Smooth, 46, *Plate* 45; Stinking, 47, *Plate* 55

Hawkweed, Mouse-ear, 49, *Plate* 57; Shrubby, 49, *Plate* 56; Umbellate, 49
Heart-shaped leaf, x
Heath Spotted Orchis, 93. *Plate* 101
Hedge-Parsley, 34, *Plate* 37; Knotted, 35; Spreading, 35
Helleborine, Broad-leaved, 143, *Plate* 134; Green-flowered, 146; Marsh, 148, *Plates* 140, 141; Narrow-leaved, 152, *Plate* 136; Red, 154; Violet, 147, *Plate* 135; White, 150, *Plates* 142, 143
Henbane, 56. *Plates* 68, 69
Herminium monorchis, 126. *Plates* 122, 123
Hieracium boreale, 49, *Plate* 56; *pilosella*, 49, *Plate* 57; *umbellatum*, 49
Honkeneja peploides, 23. *Plates* 22, 23
Horehound, Black, 59, *Plates* 72, 73; White, 60, *Plate* 75
Hyoscyamus niger, 56. *Plates* 68, 69

IMPARIPINNATE leaf, xiii
Interruptedly pinnate leaf, xiii
Irish Orchis, 110

KIDNEY-SHAPED LEAF, x
Knotted Spurrey, 23

LADY'S MANTLE, 28, *Plate* 31; Alpine, 29; Field, 29
Lady Orchis, 85. *Plates* 92, 93
Lady's Slipper Orchis, 159. *Plate* 1 (Frontispiece)
Lady's-Tresses, Autumn, 130, *Plates* 121, 125, 126; Cork, 134, *Plates* 127, 128, 130; Creeping, 128, *Plate* 124; Rydberg's, 136, *Plates* 128, 130; Summer, 132, *Plate* 126
Lamina, leaf, ix
Lanceolate leaf, x
Lance-shaped leaf, x
Large Rough Hawk's-beard, 47
Late Spider Orchis, 120
Lavatera arborea, 27. *Plate* 28
Leafless Orchis, 78
Leaflets, ix, xii
Legousia hybrida, 51. *Plate* 60
Lepidium campestre, 17, *Plate* 14; *heterophyllum*, 18; *latifolium*, 18; *ruderale*, 18; *sativum*, 19
Lesser Butterfly Orchis, 113. *Plate* 118
Lesser Meadow-rue, 2
Lesser Spearwort, 5. *Plate* 5
Ligustrum ovalifolium, 54; *vulgare*, 54, *Plates* 64, 65
Linear leaf, x
Linosyris vulgaris, 39
Liparis læselii, 158. *Plate* 139
Listera cordata, 141; *ovata*, 139. *Plate* 129
Littorella lacustris, 62. *Plate* 59
Lizard Orchis, 102. *Plates* 104, 105
Lobed leaves, xiv
Loranthus europæus, 37
Lyrate leaf, xiii
Lyrately-pinnate leaf, xiii

MADDER, Wild, 38. *Plates* 40, 41
Malaxis paludosa, 157. *Plate* 138
Marrubium vulgare, 60. *Plate* 75
Marsh Hawk's-beard, 48
Marsh Mallow, 26, *Plate* 26; Hispid, 27
Marsh Orchids, 94
Marsh Orchis, Broad-leaved, 95, *Plate* 103; Common, 96, *Plate* 109; Dwarf, 96; Early, 97, *Plate* 100

Meadow-rue, Alpine, 3; Common, 1, *Plate* 2; Greater, 2; Lesser, 2
Meconopsis cambrica, 8. *Plate* 8
Military Orchis, 87
Milk Thistle, 45. *Plates* 52, 53
Mistletoe, 36. *Plate* 38
Monkey Orchis, 88. *Plate* 95
Monotropa hypopitys, 52. *Plates* 62, 63
Mouse-ear Hawkweed, 49. *Plate* 57
Mouse-tail, 4. *Plate* 3
Musk Orchis, 126. *Plates* 122, 123
Mycorrhiza (*Rhizoctonia*), 75, 78
Myosurus minimus, 4. *Plate* 3

NARROW-LEAVED PEPPERWORT, 18
Nasturtium officinale, 11, *Plates* 10, 11; *palustre*, 13; *sylvestre*, 12
Needle-shaped leaf, ix
Neotinea intacta, 110
Neottia nidus-avis, 142. *Plates* 131, 132, 133

OBIONE pedunculata, 69; *portulacoides*, 68. *Plate* 77
Oblong leaf, x
Ophrys apifera, 117, *Plates* 114, 115; *fuciflora*, 120; *insectifera* 124, *Plate* 119; *sphegodes*, 121, *Plates* 116, 117
Orache, Frosted, 67; Spreading, 67. *Plate* 74
Orbicular leaf, x
Orcheomyces, 79
Orchids in general, 73
Orchis, Bee, 117, *Plates* 114, 115; Bog, 157, *Plate* 138; Broad-leaved Marsh, 95, *Plate* 103; Burnt, 89, *Plates* 94, 97; Butterfly, Greater, 114, *Plate* 113; Butterfly, Lesser, 113, *Plate* 118; Common Marsh, 96, *Plate* 109; Coral-root, 156, *Plate* 137; Dark-winged, 85, *Plates* 92, 93; Dwarf, 89, *Plates* 94, 97; Dwarf Marsh, 96; Early Marsh, 97, *Plate* 100; Early Purple, 84, *Plates* 90, 91; Early Spider, 121, *Plates* 116, 117; Fen 158, *Plate* 138; Fly, 124, *Plate* 119; Fragrant, 106, *Plates* 106, 107; White Fragrant, 108, *Plate* 120; Frog, 111, *Plates* 110, 111, 112; Green Man, 108, *Plate* 108; Green-winged, 83, *Plates* 88, 89; Heath Spotted, 93, *Plate* 101; Irish, 110; Lady, 85, *Plates* 92, 93; Lady's Slipper, 159, *Plate* 1; Late Spider, 120; Leafless, 155; Lizard, 102, *Plates* 104, 105; Military, 87; Monkey, 88, *Plate* 95; Musk, 126, *Plates* 122, 123; Pyramidal, 99, *Plate* 102; Spotted, 91, *Plates* 96, 98, 99
Orchis elodes, 93, *Plate* 101; *fusca*, 87; *hircina*, 102, *Plates* 104, 105; *incarnata*, 97, *Plate* 100; *maculata*, 77, 91, *Plates* 96, 98, 99; *mascula* 84, *Plates* 90, 91; *militaris*, 87; *morio*, 83, *Plates* 88, 89; *prætermissa*, 96, *Plate* 109; *purpurea*, 85, *Plates* 92, 93; *purpurella*, 96; *pyramidalis*, 99, *Plate* 102; *simia*, 88, *Plate* 95; *ustulata*, 89, *Plates* 94, 97

PALMATE LEAF, xii
Parsley, Hedge, 34, *Plate* 37; Knotted H., 35; Spreading H., 35
Parsley Piert, 29
Parsnip, Wild, 33. *Plate* 36

Pastinaca sativa, 33. *Plate* 36
Pearlwort, Annual, 22; Common, 21, *Plates* 20, 21; Knotted, 23; Sea, 22
Pedate leaf, xii
Pennywort, Wall, 30. *Plates* 32, 33
Peplis portula, 30. *Plate* 29
Pepperwort, 17, *Plate* 14; Narrow-leaved, 18; Smith's 18
Perfoliate leaf, xii
Petiole, ix
Pheasant's-eye, 3. *Plate* 4
Physocephala rufipes, 93
Phyteuma orbiculare, 50, *Plate* 58; *spicatum*, 51
Pinnate leaf, xiii
Pinnatifid leaf, xiv
Plusia v. aureum, 116
Poppy, Welsh, 8. *Plate* 8
Privet, 54. *Plates* 64, 65
Purple Orchis, Early, 84. *Plates* 90, 91
Purslane, Water, 30. *Plate* 29; Sea, 68, *Plate* 77; Stalked Sea, 69
Pyramidal Orchis, 99. *Plate* 102

QUINATE LEAF, xii

RADICAL LEAVES, xv
Rampion, Round-headed, 50, *Plate* 58; Spiked, 51
Ranunculus flammula, 5, *Plate* 5; *lingua*, 6; *ophioglossifolius*, 6; *reptans*, 6
Red Maithes, 3
Red Morocco, 3
Reniform leaf, x
Rhizoctonia and Orchids, 75, 79
Rose-a-rubie, 3
Round-headed Rampion, 50. *Plate* 58
Round leaf, x
Rubia peregrina, 38. *Plates* 40, 41
Rumex acetosa, 72, *Plates* 86, 87; *acetosella*, 72; *conglomeratus*, 71; *crispus*, 70, *Plate* 80; *hydrolapathum*, 71, *Plate* 81; *obtusifolius*, 70; *sanguineus*, 71, *Plates* 84, 85
Runcinate leaf, xiv

SAGINA apetala, 22; *maritima*, 22; *nodosa*, 23; *procumbens*, 21, *Plates* 20, 21
Sagittate leaf, xi
Salicornia herbacea, 65, *Plate* 61; *perennis* 66
Samolus valerandi, 61. *Plates* 78, 79
Sand-spurrey, Red, 26; Rock, 24, *Plate* 27; Salt-marsh, 25, *Plate* 24; Shore, 25
Saw-wort, 42, *Plates* 48, 49
Scurvy-grass, Alpine, 16; Common, 16, *Plate* 15; Danish, 16; English, 17; Northern, 17
Sea Aster, 39, *Plate* 42
Sea Blite, 64, *Plate* 83; Shrubby, 65, *Plate* 82
Sea Kale, 20. *Plates* 18, 19, 25
Sea Rocket, 20. *Plate* 17
Sea Sandwort, 23. *Plates* 22, 23
Serpent's-tongue Spearwort, 6
Serratula tinctoria, 42. *Plates* 48, 49
Shoreweed, 62. *Plate* 59
Shrubby Hawkweed, 49. *Plate* 56
Silybum marianum, 45. *Plates* 52, 53
Simple leaf, ix, xii
Small Rough Hawk's-beard, 46. *Plate* 54
Smith's Pepperwort, 18
Smooth Hawk's-beard, 46. *Plate* 45
Smyrnium olusatrum, 35. *Plate* 39

Solidago virgaurea, 40. *Plate* 44
Sorrel, Common, 72, *Plates* 86, 87; Sheep's, 72
Spatulate leaf, xi
Spergularia marginata, 25, *Plate* 24; *rubra*, 26; *rupicola*, 24, *Plate* 27; *salina*, 25
Spider Orchis, Early, 121, *Plates* 116, 117; Late, 120
Spiked Rampion, 51
Spiranthes æstivalis, 132, *Plate* 126; *gemmipara*, 134, *Plates* 127, 128, 130; *romanzoffiana*, 138; *spiralis*, 130, *Plates* 121, 125, 126; *stricta*, 136, *Plates* 128, 130
Spoon-shaped leaf, xi
Spotted Orchis, 79, 91, *Plates* 96, 98, 99; Heath, 93, *Plate* 101
Starwort, 39. *Plate* 42
Stem-leaves, xv
Stinking Hawk's-beard, 47, *Plate* 55
Stipules, xi
Suæda fruticosa, 65, *Plate* 82; *maritima*, 64, *Plate* 83
Subularia aquatica, 19. *Plate* 16
Subulate leaf, ix
Sword-shaped leaf, x

TAPINOMA erraticum, 104
Ternate leaf, xii
Thalictrum alpinum, 3; *flavum*, 1, *Plate* 2; *majus*, 2; *minus*, 2,
Thistle, Milk, 45, *Plates* 52, 53; Woolly-headed, 43, *Plates* 43, 50, 51
Toothed leaves, xiv
Torilis anthriscus, 34, *Plate* 37; *arvensis*, 35; *nodosa*, 35
Tree Mallow, 27. *Plate* 28
Trefoil, xii
Trientalis europæa, 60. *Plate* 76
Tripinnate leaf, xiii
Trollius europæus, 7. *Plate* 6
Tuberous Corydalis, 11
Twayblade, 130, *Plate* 129; Lesser, 141

UMBELLATE HAWKWEED, 49

VENUS'S LOOKING-GLASS, 51 *Plate* 60
Viscum album, 36. *Plate* 38

WATER-CRESS, 11. *Plates* 10, 11
Water Purslane, 30. *Plate* 29
Weasel-snout, 58. *Plates* 70, 71
Welsh Poppy, 8. *Plate* 8
White Fragrant Orchis, 108. *Plate* 120
White Horehound, 60. *Plate* 75
Whitlow-grass, Common, 14, *Plate* 9; Hoary, 15; Rock, 15; Wall, 15; Yellow, 15
Woolly-headed Thistle, 60. *Plates* 43, 50, 51

YELLOW BIRD'S-NEST, 52. *Plates* 62, 63
Yellow Corydalis, 10
Yellow-cress, Creeping, 12; Marsh, 13

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